THE

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THE LONDON TRAFFIC PROBLEM.

IN order to fully appreciate what the London traffic problem means, one must be able to think in millions. Year by year the journeys taken per inhabitant increase, and they now number 230 per head of the population, representing an increase of 51 per cent. during the last seven years.

The total number of journeys during the year 1911 reached the almost unthinkable figure of 1,908,846,973, or approximately 2,000 millions. The daily increase is 250,000, so that by the year 1920 the number of journeys per annum will exceed 3,000,000,000 (3,000 millions).

These figures include tramway and omnibus passengers, which account for about two-thirds of the total, the remainder being passengers on the local railways and on the trunk lines from a 30-mile limit. All of these, however, have to be dealt with in the streets of Greater London.

If we cannot quite grasp the magnitude of the problem from a contemplation of the figures 3,000,000,000, we can get a little nearer to it by glancing at the figures referring to the number of licensed vehicles in use and to the accidents which occur in the streets per annum. In the year 1912 there were 13,800 licensed power vehicles, including trams, 'buses and cabs; and only 2,800 horse-drawn vehicles.

The number of fatal accidents in 1912 was 537, or almost 1½ fatalities per day due to street vehicles. The number of injured during the same period was 20,166, or at the rate of 5½ persons per day.

The problem is not a new one, it was recognised as urgent in 1903, when a Royal Commission was appointed to inquire into it. This Commission reported on the matter in 1905, and one of the recommendations made was that the statutes relating to traffic in London should be simplified and consolidated, and that it should be one of the duties of the new body which they recommended to examine and report upon them.

That was in 1905, when the problem, urgent as it then was, did not present the difficulties which the motor-omnibus has since introduced. In 1907, there were 9,818 licensed horse cabs and hansoms, now there are only 2,385. There were also 2,961 horse omnibuses and tramcars, and 2,973 electric trams and motor-'buses, while last year there were 5,767 electric trams and motor-'buses, in addition to 8,000 motor-cabs, and the horse 'bus has practically disappeared. If, then, the laws relating to traffic were in need of simplification and consolidation, how much greater is that need at present, for it would appear that the recommendations of the Royal Commission have been entirely ignored and the deliberations, extending over two years, were so much time wasted. Let us hope that the work of the Committee, which has just gone over the same ground, will bear better fruit.

In the course of evidence given to the Committee, the provisions of the law were still described as "voluminous

scattered, redundant, defective, overlapping and difficult to understand." A witness, speaking from experience in the management of tramways, described our Traffic Laws as "antiquated, inadequate, and incomplete," whilst another, speaking on behalf of the London General Omnibus Co., complained of the great difficulty of having to consult innumerable special provisions scattered in many statutory orders.

As an instance of the unsatisfactory state of the law, it appears to be a prevalent idea that a conviction for dangerous driving cannot be obtained unless it can be proved that some person was thereby actually endangered. This is probably the reason why newspaper runners are permitted to race on bicycles through the busiest streets of London at breakneck speed distributing papers right and left to news boys. They are certainly a menace to life and limb, and we agree with the testimony of a police witness that the cycle is an unfit vehicle for the crowded streets of London. This view is emphasised by the fact that in the year 1912 there were 65 cyclists killed by power-driven vehicles, and 21 other persons were killed by ordinary cycles. As to non-fatal accidents during the past three years, no fewer than 12,813 reported injuries to persons were caused by cycles, a considerably larger number than is caused by any other class of vehicle.

The police, to whom the Committee pay a well-deserved tribute, have at present many difficulties to deal with, owing solely to the unsatisfactory state of the law. For instance, a driver of a motor-'bus may be incapable of carrying out his duties due to the influence of drink; but, unless he is legally "drunk," he cannot be charged. Again, the question of vehicles taking in or delivering goods across a pavement and partially blocking the roadway is one which makes the administrative duties of the police very difficult and unsatisfactory. A case in point is the difficulty which at present exists in the Strand. At a cost of £560,000 the City of Westminster widened the Strand at Holywell Street. The whole of this improvement is practically rendered valueless by the action of Messrs. W. H. Smith & Sons, who occupy a large portion of the widened area with their carts, which, "from early morning till late at night," stand with the tail of the cart against the curb and the horse's head out in the road, thus practically taking up the space of two lines of traffic. Owing to the present state of the law the police cannot stop this, as it does not constitute legal obstruction.

Touching on the question of the motor-'bus, this is impeached in the Committee's report as follows: "The Committee are of opinion that the record of the motor-omnibus in the matter of accidents is most unsatisfactory." The total number of fatal accidents due to motor-omnibuses in 1912 exceeds the total for every class of vehicle combined in 1905. The figures for 1912 are 182, or at least one person killed every two days by a motor-'bus. Moreover, the police returns of fatalities and accidents for the metropolitan area attribute to the motor-omnibus 41 deaths and 637 accidents in the first quarter of 1913, and 46 deaths and 845 accidents in the second quarter.

Apart from fatalities, however, the conditions of the roads are rendered quite unsafe by the present methods of running motor-'buses. We have done with the competition between the L.G.O. and the Road Car Co., a competition which was such a prolific source of accidents, but we have instead the competition between the L.G.O. and the electric tramcar. It was explained by witnesses how the 'buses run along the cars, and stop at the same places in such a way as to prevent people either entering or leaving the cars. Or if people are doing so a car will come up behind on the near side and terrify them by its noise. Many people, as the report states, are positively afraid of using the cars on account of the 'buses. A species of "dumping" is practised by the L.G.O., the fares charged on tram routes being lower, and in many cases about half the fares charged for a corresponding distance on routes where trams do not run.

But we must refer our readers to our summary of the report on p. 287 for details, and here allude only briefly to the recommendations. These are that a new Traffic Branch of the Board of Trade shall be created, which shall combine the duties of the Home Office, Local Government Board and Board of Trade, including the confirming of by-laws. That the veto of the Borough Councils in regard to tramway schemes shall be replaced by a full hearing before the new Traffic Branch, which shall report to Parliament, and that the County Councils in the Metropolitan area shall have the widest possible by-law-making powers, subject to confirmation by the new Traffic Branch of the Board of Trade.

Outside the Committee, few people will be found who consider that the foregoing recommendations will solve the traffic problem. On the contrary, it will lead to endless litigation between the County Councils and the omnibus companies. The seven County Councils concerned will make by-laws to suit their own particular area, and these by-laws will no doubt be different in different areas. This clearly is quite an unworkable system when we consider that the motor-'buses of one company alone would be subject to the laws of seven authorities, all of whom are interested in competing systems of trams. Nor does the past record of the L.C.C. inspire us with any confidence that they are competent to deal with the question. One has only to watch the disgraceful and dangerous scrambles which take place between 5 and 7 every night at certain of the tramway termini, by those wishing to get home, to appreciate that the L.C.C. is not a desirable body to entrust with the making of by-laws to regulate traffic in general.

The improvements which have recently taken place in the control of traffic in the City since the Commissioner of the City Police made regulations directing the routes of omnibus traffic, &c., lead us to think that the Commissioner of the Metropolitan Police might be able to effect similar improvements in the Metropolitan area. In this view we are in accord with the recommendations of the Royal Commission, which considered that in the Metropolitan Police area by-laws and regulations should be made by the Commissioner of Metropolitan Police, with the approval of the Secretary of State for the Home Office, and in the City by the Commissioner of Police of the City, with the approval of the Court of Mayor and Aldermen.

The police have always been subject to the Home Office, and it would lead to endless confusion if they are to be in future subject also to a sub-department of the Board of Trade.

MINE MANAGEMENT.

We have frequently drawn attention to the very unsatisfactory way in which our coal mines are managed, and to the somewhat questionable efforts of the Government to rectify matters by passing Acts of Parliament legalising all kinds of regulations, which, if much further increased, will do away with the necessity of any management at all, as only a policeman will be required to see that each man carries out his duty as specified by the Act or "regulation."

Under Sec. 86 of the Coal Mines Act, 1911, the Home Secretary is empowered to issue new "regulations" from time to time, or to alter old, as experience or circumstances may determine, and a set of new general regulations, which come into force on September 15th, have just been issued. These are divided into seven parts, and contain 190 separate regulations, in which the special electricity rules are included. The intention is to secure, as far as possible, uniformity in rules controlling the working of the mines and setting forth the duties of officials and workmen, which, previous to the passing of the 1911 Act, were defined under "Special Rules" drafted by the colliery company and approved by H.M. Inspector of Mines, which rules are now revoked.

The duties of the manager, under-manager, fireman, examiners, deputies, winding engineman, fan engineman,

boiler minder—and under the electricity rules—the electrician are stated. The manager, under-manager, and fireman must have "certificates," but no mention is made of the qualification required of the engineer, or the electrician, and so far as required by the regulations, anyone can be appointed by the manager to these positions if he considers him "competent." In fact, as regards the mechanical side of the plant, he need not appoint any mechanical engineer, as it is sufficient to appoint in writing a "competent" person to carry out certain special duties such as the re-capping of winding ropes, &c.

The manager's duties are thus defined :—

"35. The manager shall appoint in writing to be officials of the mine such number of *competent* persons as will be sufficient to secure a thorough supervision of all the operations in or about the mine and the enforcement of the requirements of the Act, and of the regulations and orders made thereunder. He shall assign their duties to the several officials of the mine, and shall to the best of his power see that each official understands and carries out and enforces those provisions of the Act and of the regulations and orders made thereunder, which relate to the matters in respect of which duties are assigned to him.

"36. He shall give attention to and cause to be carefully investigated any representations or complaints . . affecting the safety and health of persons in or about the mine.

"37. Relates to (safety) lamp stations.

"38. He shall see that *a sufficient supply of proper materials and appliances* for the purpose of carrying out the provisions of the Act, and ensuring the safety of the mine and persons employed therein, is always provided, and, if he be not the owner or agent of the mine, he shall report in writing to the owner or agent when anything is required for the aforesaid purpose that is not within the scope of his authority to order." (The italics are ours.)

Anyone with only a slight knowledge of the operation of a coal mine will agree that a colliery manager's lot, like the policeman's, will not be a very happy one, and after he gives his attention to all the multifarious reports and complaints from officials and workpeople, he will have little time left for the technical direction of the mine. And how is he to keep himself abreast of the times by the study of technical literature on the science of mining and mining machinery, which, like other industries, is always progressing, and especially that relating to electricity in mines? We cannot think that any good will be the outcome of this increase of responsibility in regard to superficial supervision by the manager. It would appear that his duty now is not to see that the work itself is done in a proper workmanlike manner, but to receive a report from the official or workman that it has been done. Then again, there is the question as to whether the manager has that skilled knowledge and experience which would enable him to say whether the work had been satisfactorily carried out. We allude principally to work connected with engineering and electricity. In addition to all the duties connected with the mine, he must also organise and equip one or more rescue brigades, depending upon the number of workmen employed underground. Many experienced mining engineers question the use of this apparatus, and in the House of Commons a question was raised as to the absence of rescue apparatus in the recent fire at Cadder Colliery, which caused the loss of 22 lives, when Mr. McKenna said that a full inquiry was to be made into the whole of the circumstances. We await the report of this inquiry with interest, as it is suggested that the fire was caused by electricity.

A point of importance is that, according to regulation (38), the manager is responsible for the supply of proper materials and appliances, but only up to the value of the amount he is given authority by the owner or agent to spend ; after that he is to put his requisition in writing to the owner or agent. But suppose it is a case of emergency, and neither owner or agent is available, who is responsible in case an accident results? Recently, at Ashby-de-la-Zouch Petty Sessions, the Meacham Collieries, Ltd., were fined £105 and £24 4s. costs in connection with offences under the electricity rules, while Mr. Watson, who, at the time, was manager of the colliery, and who was charged with the breach of the rules at the same time, was exonerated. The breach of the rules was admitted, but the question the Bench had to decide was as to who was responsible. The manager had duly reported the state of affairs to the managing director, Mr. Waddle, who, Mr. Watson said, refused to spend the necessary money, and he himself had no authority to order material beyond a very small amount. Mr. Watson's case is not solitary by any means, and many managers have not even the choice or selection of the stores or plant required or bought for the colliery. Probably in most cases owners are morally to blame for accidents, and not the distressed manager, who has the sword of dismissal constantly hanging over his head if he does not work the mine, not always as he would like, but at the dictates of his superiors and according to the material to his hand. No! What our collieries want is less law and more men trained in the actual science of mining and mine engineering, instead of in rules and regulations for working a mine and the best way to avoid them to save a little cost, as is actually happening now. Engineers are wanted, not lawyers' clerks, or glorified policemen.

Copper. There has been a very large business done by consumers of copper both in Europe and America, and the tendency of the market, with fluctuations, has been one of much firmness, aided by good statistics and labour difficulties of serious moment in the Lake Superior district. As far as can be gathered this area is still in the throes of the labour trouble which broke out some weeks ago, and production at the mines and also at the local smelters has been entirely suspended. The Lake Superior district produces a matter of 8,000 tons of refined copper a month, and the market cannot afford to regard the withdrawal of such a quantity with equanimity. In addition to this there seem to be more or less grave difficulties impending in connection with the electricians at the mines of Butte and Utah, and there is a fear that if the threatened strike eventuates, the copper output of these important camps will also be checked. The market is in no condition to stand any further disturbance of output with equanimity, and it is only the generally more or less overcast outside influences which have stood in the way of a very considerable appreciation in values. It must not be forgotten that a year ago, with the statistical position far less strong than that of to-day, prices were a matter of £10 a ton higher. If once the impression gained firm hold in speculative circles that copper was in a dangerous position, from the point of view of the bears, there might easily be something approaching panic conditions witnessed. The last few weeks have seen the release of orders for many thousands of tons of copper needed in connection with the fulfilment of electrical schemes, which had been held up for a time, owing to the unfavourable political and monetary outlook. With the brighter atmosphere recently prevailing, however, there has been some revival of confidence, and the prospects are that the consumption of copper on both sides of the Atlantic will be at a record rate, at all events over the remainder of the year. The shortage in production is, of course, the most important factor for the time being, and the labour unrest might play a still more striking part within the next few weeks. The talk of increased production as regards the United States is mere talk, as far as can be ascertained from the figures which are obtainable, any increase from the newer and low cost properties being fully offset by the reduced yield of the older and higher cost mines. This is an aspect of the copper situation which it would not do to ignore. Considerable interest attaches to the next returns of the American Copper Producers' Association, the estimates of the market in connection with which vary widely. If the shortage of production at the Lake Superior mines is to show however, it is certain that there must be a further reduction in the available stocks of unsold copper at United States refineries, and if this prove to be the case, then the price of copper must go higher yet.

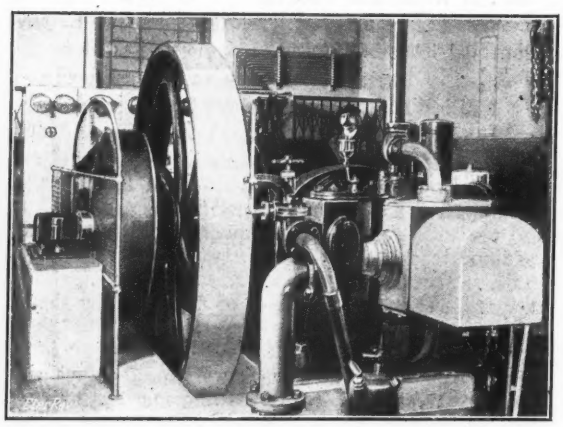
D

ELECTRICITY ON A HIGHLAND ESTATE.

A complete electric light and power installation has recently been installed at Belladrum House, Inverness-shire, which includes a 30-B.H.P. Hornsby oil engine running on shale oil

Belladrum House, Inverness-shire.

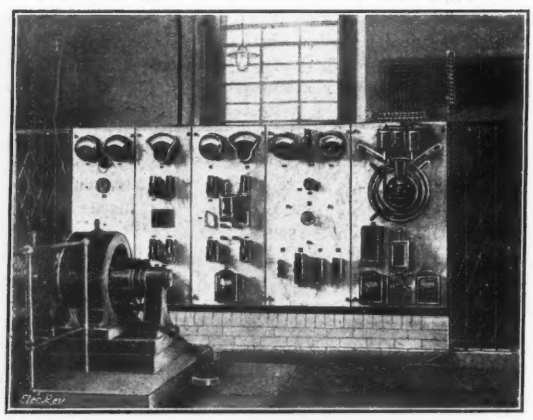
and belt connected to a 15-kw. dynamo by the Lancashire Dynamo Co., and an E.P.S. battery having a capacity of 650 ampere-hours for 10 hours, with regulating cells con-



Generating Plant, Belladrum House.

trolled automatically by a Bertram Thomas regulator, fitted on the main switchboard.

Besides the electric lighting of the mansion and gardens, home farm and outbuildings, electric power is used for



Main Switchboard, Belladrum House.

radiators and two electric lifts in the house, whilst current will ultimately be furnished to motors in threshing and saw mills attached to the home farm.

The wiring is carried out with solid drawn conduit, and the underground mains are laid in creosoted wood troughing filled in solid with plastic pitch and covered with tiles.

The lifts for passenger and kitchen service by Messrs. A. & P. Stevens, Ltd., are fitted with automatic push-buttons for "up," "down" and "stop" control, and emergency stop and return buttons.

A system of electric bells and telephones is installed throughout the house, also to several outbuildings on the estate.

The house is protected against lightning by conductors fixed to eight finials at roof corners. These are connected to a ring conductor traversing the outer edge of the roof, and the whole system is earthed at four positions, where 4 sq. ft. iron plates are embedded in the ground 2 ft. beneath the surface. This installation was entirely carried out by Messrs. Underhill & Ritchie, Ltd., Glasgow, to the specification of the consulting engineers, James E. Sayers and Caldwell, of Glasgow.

LIGHTNING.

By E. P. Austin, A.M.I.E.E.

The vagaries of lightning are always a source of interest and wonderment, so that the following account of the effect of a recent severe lightning storm on a direct-current supply may be of interest:—

There are two distinct systems fed from one station, but by entirely separate generators and switchgear. The first is a three-wire supply system using triple-concentric paper-insulated cables, with the neutral earthed at the station only. Connected to the same bus-bars are two overhead lines supplying power. They follow a route up a hill side in open country, rising about 80 ft. in 600 yards; the route then follows a highway, underground cable being used for about 250 yards, changing to overhead, and descending the hill, falling about 60 ft. in 300 yards. At each end, and at junctions with underground cables, horn-break arresters and kicking coils are used.

The second system is an ordinary overhead tramway supply, with lightning arresters at all feeding boxes, to station bus-bars, and on the cars. The whole supply area lies in a hollow, and the highest point is crossed by the above-mentioned overhead line, which is higher than any hill within a radius of 2½ miles.

With this brief topography of the district in mind, we will proceed to consider the behaviour of the storm and its manifestations. The storm approached from the south-east at 5.30 p.m., and broke with exceptional violence over the town, reaching its maximum force between 5.45 and 6.0 p.m. Lightning flashes were numerous and frequent, the intervals between being scarcely perceptible; and, as events proved, the discharges were frequently to earth.

The first indication of trouble was received on the traction system at 5.52, two distinct feeders connected to adjacent trolley wire sections being affected. In each case an arc jumped a gap from the live terminal to the earthed ironwork of the connecting boxes, the respective distances being 1½ in. and 2 in. The short distance was in a pole box and a following-on current completely destroyed the interior fittings, and went to earth *viâ* bond and guard wires, which were fused. The arc in the other case discharged in a feeder pillar, and cleared itself without interruption to the supply. Not one of the many arresters showed signs of operation.

The trouble on the lighting system occurred at 5.55, and was more far reaching in its results. A distributor in the centre of the network was broken down in two places within 50 yards, at one point being burnt through, and at the other breaking down in a service box.

At the consumer's end of the previously-described overhead lines a high-potential discharge took place. In one case a large motor armature was broken down to frame, and in another case an arc jumped a space of 3 in. from one terminal of the board to the iron supporting frame. All

the lightning arresters were in perfect order, yet no signs of operation were shown on the horns.

During the storm a house was struck and badly damaged at a time corresponding with the mains disturbances, and on marking all the positions of trouble on the map, it was found that a straight line could be drawn from this house through all the points marked except one, and the distance was one mile. The remaining trouble occurred within half a mile of a discharge, which fatally struck a child standing in the middle of a broad roadway.

It has been observed previously that damage has resulted from lightning discharges up to a distance of 5 miles, apparently through terrestrial disturbances. The writer has experienced cases where sparks jumped across long gaps separating lead-covered house wires and gas pipes, with dangerous results during a storm, when a discharge occurred half a mile distant.

These effects point to the conclusion that breakdowns from lightning do not all originate from atmospheric disturbance, and that the use of condenser protective devices on supply systems is advisable to protect apparatus from terrestrial disturbances.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Shift Engineers: A Proposal.

Like your ingenious and thoughtful correspondent, W. E. Pritchard, I, too, have often wondered why the members of the fair sex should regard the modern day power house and its plant as a kind of "forbidden fruit." It requires but little imagination on a reader's part to conjure up a happy picture of switchboards attended to by blushing (or rushing) damsels, or Girton girls, if, as mentioned in the letter in the REVIEW, the applicants should "have had the advantage of higher education and some laboratory experience in the physics department." Could not the Universities be moved to grant a "Switchboard Attendant's" Diploma, in the curriculum of which the multiplication table and spelling-book might well count as valuable components?

What a picture of felicity every power house would present if the charming daughters of Mother Eve were but allowed to exercise their gentle wiles upon such unrelenting things as 20,000-volt switches, &c. How home-like everything would look. Again, what glorious opportunities would present themselves for the designer of switchboards to exercise his æsthetic tastes. A mirror could be fitted to each panel of the board to enable the operator to see whether her general appearance was in harmony with the surroundings, and a tea room with gipsy tables, &c., would become a feature of every power house which claimed to be up-to-date.

Approaching this subject from the economic side, it can easily be seen what a Godsend the new era would be to married men with wives mechanically or electrically inclined. For example, the husband could be on day-shift, and the "missus" relieve him of his arduous duties when the time came. Thus would money flow rapidly into the coffers of the Mr. and Mrs. "Shift Engineer, Ltd."

But, Mr. Editor, why confine the duties of shift engineers to men and women? Could not some enterprising gentlemen try the experiment of training baboons or chimpanzees for the coveted posts in our generating stations? Of course, practical difficulties might occur in the employment of these latter, for instance, their caudle appendages might easily have a tendency to short-circuit switches, &c., but, of course, these portions of their anatomy could easily be wrapped with insulating tape. This latter is merely a suggestion—other solutions will easily present themselves to a thinking mind.

In regard to engine driving, a "mere male" could, of course, perform such trifling functions as starting and stopping the running plant, and then hand over his reins of office (or to change the metaphor), his "swobbing" rod and oil can, to his feminine "relief."

In regard to the boiler-house working, women of course could, I think, easily manage a shovel, as from time immemorial, they have always been credited with a facile use of its companion, the poker.

In conclusion, I sincerely trust that this question will be fully considered in all its bearings by the "powers that be."

C. F. Browne.

August 16th, 1913.

I read with great interest the correspondence on the above subject, and quite agree with the writer, that the average educated woman *could*, easily, perform the ordinary routine work of the switchboard attendant.

I have no doubt she would also be a "Godsend" to the average charge engineer. Congenial companion on night shifts, for instance.

But, there is one other point which, apparently, has been forgotten. Women, as a general rule, are "fair weather" workers; when out of their natural sphere I tremble to think how a woman would have acted in a case such as the recent disaster at Stepney, when a 2,000-H.P. turbine, which "requires practically very little attention," left its bedplate, and various portions of it were hurled through the corrugated iron roof, to be found later embedded in the door-step of a neighbouring hostelry; to say nothing of minor pieces, which have not yet returned to earth. Or, again, the possibilities appertaining to a mouse in the boiler house! Several well-educated women, with whom I am acquainted, are afraid, positively afraid, of an electric radiator, and would not have one in the house on any account! They tell me that electricity is so dangerous! Imagine one of these women on the switchboard, in an emergency.

Oh! Oh! Mr. Pritchard how could you. Have no fear switchboard attendants, your realm will not yet be invaded by the fair sex, but as you value your self-respect, curtail your energies in that "sweeping up and dusting, which you cannot make a good job of, and stick to the switches."

"In jesting guise, but ye are wise
And know what the jest is worth."—*Kipling.*

A Mere Woman.

Suppose that among the Pritchard coterie there should happen to be a Sylvia, or one of that ilk, what would prevent it from dropping a bar of copper across terminals, and generally playing the game as it appears fair to the feminine instinct—I had almost written intelligence.

It may be doubted if Mr. Pritchard's circle would consent to mechanically-fed hoppers. What would happen at any lighting station which was discovered to be supplying a Cabinet Minister? The whole silly gang of shift boarders would hunger strike, and they would want to be called something else than shift.

Common Man.

I should like to be permitted to say a few words in answer to Mr. W. E. Pritchard's letter.

I don't know whether the writer is a suffragette or a hen-pecked husband, but, in any case, it is quite obvious that she or he is absolutely ignorant of the duties of a shift engineer. In the first place, the duties of a shift engineer do not consist in cleaning, attending to engines, or filling coal-hoppers; he is a man with a high technical knowledge of the profession, and one to whom the remainder of the shift look for instructions in times of trouble.

Above all things, it is absolutely essential that he should keep a steady and clear head when things are not running smoothly, for a slight error on his part, or lack of knowledge, may cause thousands of workpeople, trams, &c., to stand idle.

Seeing, therefore, that supply authorities realise that the reliability of their supply is their greatest asset, it is little wonder that women have not been employed in station work. If Mr. Pritchard would have a walk round some of our largest power stations, he would soon recognise that the duties of the man in charge are much more trying to the nerves than are typewriting, clerical work and window-smashing—such as women are able to manage.

Shift Engineer.

August 18th, 1913.

A Question of Etiquette.

I was very glad to see the letter of Mr. Riley in your issue of the 8th inst. He draws attention to a subject which is of vital interest to all connected with the development of the electrical industry, and you would be adding one more to your long list of public services if you were to open your columns to the views and suggestions of those concerned on this subject.

I have had some experience of municipal supply authorities, and have, therefore, some knowledge of the methods by which some of them conduct their sales departments; but I must confess to being amazed when I saw in the "Legal Column" of a recent issue of the ELECTRICAL REVIEW that, as the result of a recent arbitration, an award was made against a well-known municipal supply authority on the ground that they had overcharged a customer to the extent of 60 per cent., and "that, having regard to all the circumstances, the work had not been carried out on a suitable system, nor with the best workmanship, and was not in accordance with the wiring rules of the I.E.E."

Now, a supply authority has an absolute veto over the work done by an electrical contractor in the district in which it operates, and, therefore, if it wishes to take up installation work, it can, as pointed out by your correspondent, stifle competition by a series of unnecessary rules and regulations which force the contractor to put in a price much higher than their own, and ultimately kill electrical contracting work in the district. It must be noticed that the supply authority is not obliged to enforce its own rules against its wiring department, hence there is practically no control exercised over the work done by any supply authority. Surely this is a flagrant injustice upon the private contractor. Ought not every supply authority to be obliged to do their own work in accordance with their own regulations? It does seem to me that the supply authorities have far too free a hand in this direction, and that the Board of Trade should exercise a much greater amount of control over the work done by them.

To Mr. Riley's query, I should most emphatically answer, "Yes, certainly inform the Board of Trade and the fire offices concerned, as it is in the best interests of the profession, the trade, and the public, that these parasites of a great industry should be exposed, and their jerrymandering methods put a stop to."

In the infancy of a new industry, a new profession, it is essential that it should be protected from the undermining influence of rotten materials and rotten workmanship, and all of us, therefore, who have the cause of electricity at heart, and who believe that it is capable of almost infinite development and expansion in directions hitherto only faintly foreshadowed, must feel that no effort should be spared which has for its object the introducing and maintaining of sound knowledge, sound materials, and sound workmanship.

It must not be thought that I am making an indictment against all supply authorities. Many of them run their sales departments on thoroughly sound lines, and are a real help to the local contractors; but the point that I should like to emphasise is not so much that a few supply authorities run their wiring departments in an unfair and rotten manner, but that all of them have the power to do so if they choose.

By all means let Mr. Riley disclose the names of the companies he has come across who put in rotten work, and, perhaps, it may have the effect of making the Board of Trade realise that they might with advantage look more closely into the work done by supply authorities and electrical contractors generally.

Cunningham, Ltd.
A. W. KIMBER, *Manager.*

August 15*th*, 1913.

Dry and Wet Air Filters.

I find that Continental constructors of turbo-generators express themselves averse to water spray filters instead of cloth air filters, notwithstanding the temporary success of the water spray filter in this country. They point out that damp cooling air will especially affect generators under varying load. In such cases while the machine remains cold, damp may be deposited in its interior. We have met with cases of installations fitted with dry air filters where the generators became so damp that the water literally ran down them. This happened in damp and foggy weather, the air being taken from the outside, and we got over the difficulty by taking a part of the air from the engine-room. Generators thus suffer from damp even in cases where the air has not been specially moistened, and the generator builders fear that there will be many more such cases, where the air is filtered by a water spray. We are still afraid that the use of water spray filters will eventually injure the generators, and the temporary success of some installations using this type of filter can hardly be considered as a definite and final proof that water filtering is superior to dry filtering by means of a cloth.

H. R. Witting.

London, *August* 13*th*, 1913.

Systems of Wages Payment and Scientific Management.

I note that Mr. G. C. Allingham, in his letter in your current issue, confirms several of the points raised in my recent article. He, however, makes one misstatement, and infers another.

I have re-read my article, but cannot trace any statement that "scientific management was merely a system of wages payment." I simply said that writers on this subject sometimes claimed exaggerated results, and gave an instance of this. As a matter of fact, I am a great believer in scientific management myself when properly applied.

Mr. Allingham also infers that I stated that "no system is of any use." As one of the main objects of my article was to advocate the "fixed bonus system of wages payment," I cannot see upon what grounds this statement is made. I certainly wrote that no system is any use unless worked by an intelligent and zealous staff, and to this statement I strongly adhere. Especially do I do so as the tendency of some writers is to reduce the worker, and, to a large extent, the staff, to the level of mere machines. I would maintain that no system can be a success in the long run which requires the people operating it to convert themselves from human beings into machines.

Zähler.

August 18*th*, 1913.

Prevention of Accidents in Electric Lifts.

Messrs. Smith, Major & Stevens, in their letter published in your August 8th issue, admit that closing the switch last in order of time is a most attractive ideal.

Perhaps they will now agree that their championship of a wrong system eight years ago (see their letter published June 27th) was singularly unfortunate.

If Messrs. Smith, Major & Stevens will look again at each of Mr. Cooper's letters to this journal, they will see a reference to danger arising from the fact that with all ordinary locking systems the lift can start before counterlocking is effected, and that uncounterlocking and recounterlocking take place as the lift travels.

Such reference is also made (as they point out) in their own letters. Then why on earth did they make the following remark in their letter published June 27th?

"'Helicon' appears to understand what 'danger' was in Mr. Cooper's mind when writing about the moment at which counterlocking is effected. Frankly, we do not, nor can we find it defined in that gentleman's letters. Mr. Cooper certainly started out to describe a danger, but what followed referred merely to an irritating annoyance."

As regards locks that "fill the bill," of which your contributor has stated (not shown) there are four or five, presumably they are not very satisfactory articles, or their advantages are not sufficiently realised, for one hears little of them. They cannot be in accordance with the principles advocated by Messrs. Smith, Major & Stevens.

Helicon.

[We think it is time for this correspondence to be closed.—EDS. E.R.]

Harrogate.—The Lighting Committee of the T.C. has resolved that where the consumer's demand outgrows the capacity of the service cable, which necessitates the laying of a new service, the consumer be charged half the cost of the new service, and he be credited with 50 per cent. of the amount on his first year's extra consumption, and the remaining 50 per cent. on his second year's consumption, provided that where the consumption falls shortly after the new service has been put in, no credit be allowed.

NOTES FROM CANADA.

[FROM OUR OWN CORRESPONDENT.]

Some considerable time ago mention was made in this column of the fact that the Canadian Pacific Railway intended to electrify certain sections of line in the West; it now appears that a contract has been let for the necessary machinery for the electrification of a section of line, some 30 miles long, in British Columbia, in which there are heavy grades and many loops.

Development of water powers in the province already mentioned is likely to proceed apace in the near future. Besides several other schemes recently proposed, there is that of the Bridge River Co., which is worthy of more than passing notice. No less than 200,000 H.P. is involved in the proposal, and the necessary works will include the construction of a large dam, and the driving of a tunnel $1\frac{3}{4}$ miles long, through a mountain. Apparently, it is the intention of the company to start work this year, if possible.

From Hamilton, Ontario, to the Niagara River *viâ* St. Catharine's, the Canadian Pacific Railway Co. propose to run an electric railway.

It is likely that a Commission will shortly be appointed by the Dominion Government, whose duty it will be to investigate the possibilities of water-power development from the head of the Great Lakes to Montreal. The name of this body will be the "St. Lawrence and Great Lakes Commission."

Although in Eastern Canada the Canadian General Electric Co. and the Canadian Westinghouse Co. seem to hold sway as regards contracts for electric plant of moderate and large capacity, it is not always so further West. Messrs. Vickers, Ltd., have lately received an order from the city of Winnipeg for three 5,000-KW. generators with spare parts, and Messrs. Bruce Peebles have secured the contract for the supply of one 1,200-KW. motor-generator for the city of Regina, Saskatchewan; the Canadian British Engineering Co. has also done quite good work in the West recently.

The following scale of wages, which has recently been decided on jointly between the Toronto Hydro Electric Commission (not the Provincial "Power" Commission) and the electricians, may be of interest to some readers of the Review, though it must be remembered that the cost of living at the present time in Toronto is practically double what it is, say, in Manchester:—

Linemen.—Class A 37 cents per hour.
" —Class B 34 " "
" —Class C 31 " "
Helpers.—Class A 30 cents per hour.
" —Class B 27½ " "
Cable jointers.—Class A 38 cents per hour.
Helpers.—Class 27½ cents per hour.
Electrical Mechanics.—Class A 41 cents. per hour.
" " —Class B 38 " "
" " —Class C 34 " "
" " —Class D 32 " "
Helpers.—Class A 30 cents per hour.
" —Class B 27 " "

The men are to have all legal holidays with full pay and will have every alternate Saturday afternoon off.

The business section of Montreal was seriously hampered recently by having all telephone communication interrupted owing to an insignificant fire on the switchboard in the main exchange.

A Glasgow "Wireless" School.—The Faraday Correspondence Schools, Ltd., Glasgow, are contemplating the erection of a school for the training of students in wireless telegraphy. The site of the proposed buildings is in the suburb of Giffnock, to the South of Glasgow. There will be a large class room, two wireless instrument rooms, aerial room, engine room, storage battery room, &c. There will be six sets of portable wireless instruments, each capable of transmitting up to 20 miles, and receiving up to a radius of 150 miles. In the aerial room there will be, however, a powerful long-distance apparatus, capable of getting into touch with all the wireless stations in Europe. The school is planned to accommodate 150 students at one time, and the classes will be arranged to deal with 1,800 students per annum. Mr. J. H. Ballantyne is the managing director.

THE LONDON TRAFFIC PROBLEM.

SUMMARY OF SELECT COMMITTEE'S REPORT.

A Select Committee was appointed in November, 1912, and reappointed in March, 1913, to inquire into the circumstances which have led to the large and increasing number of fatal accidents in the metropolis due to motor-omnibuses and other forms of power-driven vehicles, and to make recommendations as to measures to be taken to secure greater safety in the streets. This Committee has now issued its report, which is summarised below:—

	1907.	1912.
No. of horse cabs, hansoms, horse omnibuses, and horse tramcars	12,700	2,800
No. of electric trams, motor-'buses and motor-cabs	3,700	13,800
Total	16,400	16,600

Hence, whilst the actual number of street vehicles has not greatly increased, the position is reversed. The above figures do not include heavy commercial vehicles, where motors are replacing horse traction. The motor-driven vehicles comprised in the 1912 figures include 8,000 motor-cabs and 5,800 electric trams and motor-omnibuses. The number of journeys taken per inhabitant has increased by 51 per cent. since 1904, and is now 228 per head. Including the railway passengers from a 30-mile limit, the total in 1911 was almost 2,000,000,000, and if the same rate of growth be maintained, the number by 1920 will be 3,000,000,000. The figures for 1911 are as follows:—

Tramway passengers	821,819,741
Omnibus "	400,628,487
Local railway "	436,398,745
Trunk railway passengers from a 30-mile limit	250,000,000
Total	1,908,846,973

	1904.	1908.	1912.	Ratio 1912-1904.
Number of fatal accidents in the metropolitan area	155	326	537	About 3½ to 1
Number injured in metropolitan area	10,384	16,674	26,166	" 2 to 1
Percentage of accidents to population	0·177	—	0·303	" 1¾ to 1

During the past three years the fatalities caused by horse-drawn vehicles in the metropolitan police area have not varied to any great extent, averaging 150, whereas those due to power-driven vehicles have increased from 214 in 1910 to 369 in 1912. As the number of horse-drawn vehicles has decreased considerably there is some new factor which has affected horse traction and pedestrians.

Influence of Lighting.—During the past three years the number of fatalities which occurred before sunset was 508, and after sunset 355, of which 339 are said to have occurred where the lighting was good; lack of illumination does not therefore appear to be an important factor.

Influence of Width of Roads.—The statistics do not show that broad roads conduce to safety, as the greatest number of accidents occurred in roads between 30 and 40 ft. in width, whereas the smallest number occurred in the narrowest streets, viz., those under 20 ft. in width. The explanation of this is, no doubt, that in the broad streets motor-'buses run in greater numbers.

More exact statistics were obtainable in connection with the L.C.C. Tramways, from which it would appear that greater caution is observed in narrow than in wide streets:—

Miles of tramways.	Width of road.	Fatal accidents in 6 years, 1907—1912.	Accidents per mile.
13¾ ...	Under 32 ft. 6 in.	4	0·29
54¾ ...	Between 32 ft. 6 in. and 36 ft.	22	0·4
30⅝ ...	" 36 ft. and 40 ft.	30	0·98
26 ...	" 40 ft. and 50 ft.	27	1·0
14½ ...	Over 50 ft.	16	1·1

Influence of Congestion.—The data shows that the motor-'bus is more dangerous, the greater the congestion, whilst motor-cars are more dangerous in light traffic, where higher speeds are possible. The small number of accidents due to tramcars in very congested areas, is probably due to the fact that in many of the congested traffic points north of the Thames there are no trams. The following figures are interesting, and are for the three years 1910, 1911, 1912:—

Nature of traffic.	Percentage of fatalities due to motor-'buses.	motor-cabs.	light motor-cars.	Total.
"Very congested"	58 per cent.	16 per cent.	—	141
"Congested" ...	52 "	—	19·6 per cent.	234
"Considerable" ...	36 "	14 "	27 "	304
Medium	10 " / 10 (trams)	—	39 " / 25 (heavy motor-cars)	92
Light	below 10 %	12 "	53 per cent.	92

Influence of Speed.—The evidence and data show that the enforcement of a speed limit would not have prevented fatalities, as about 30 per cent. occurred in connection with vehicles travelling at speeds below 5 miles an hour, 50 per cent. between 5 and 10 miles per hour, 10 per cent. between 10 and 15 miles per hour, and less than 3 per cent. at speeds between 15 and 20 miles per hour.

Tramways.—Data were obtained as to fatalities in streets served by tramways only, and by tramways and motor-'buses, but nothing

in the evidence given showed that the tramways, even indirectly, had any connection with the alarming rise of fatalities in recent years.

Children.—In 1911 there were 173 children killed and 5,075 injured, of which 75 per cent. were boys. The fatal accidents to children were 34 per cent. of the total in the metropolitan police area. Evidence tended to show that "in almost every case of a child it was impossible for the driver to avoid the accident." Tramcars stop before passing elementary schools, and instructions have been given to 'bus drivers to do so, in consequence of a communication from the L.C.C. The schools offer the best means for instilling caution into the children in regard to street dangers.

Cyclists.—Cyclists were involved in 4,705 accidents in 1911—about double the number which occurred in 1910. In 1912 the number of cyclists killed by power-driven vehicles was 65, and 21 other persons were killed by ordinary cycles. Of the 28,470 injuries to persons caused by vehicles other than power-driven vehicles, during the last three years 12,813, or 45 per cent., were caused by cycles, a considerably larger number than is caused by any other class of vehicle, including all types of motor vehicles. The number of cyclists killed was 23, 33 and 65 respectively, showing that the increased street danger due to the introduction of power-driven vehicles had affected cyclists in a greater degree than it had affected pedestrians.

A police witness was of opinion that "the cycle is an unfit vehicle for the crowded streets of London." The tramways manager of West Ham strongly criticised the venturesomeness of cyclists, and said they would not keep to the left side of the road, and "swerved about from right to left with a complete disregard of vehicles which are following them."

Carelessness of Drivers and Pedestrians.—A pedestrian has a clear right to the use of the road, and carelessness on his part does not justify lack of care on the part of a driver.

Regulation of Traffic in the City.—Out of a total strength of 1,180 officers and men, 228 are engaged in regulating traffic.

Subways.—Prior to the opening of the subway at the Mansion House there were 64 accidents at this point in 12 months: after the subway was opened there were only 41 accidents in 12 months.

At the Blackfriars Crossing there were 56 accidents in 3 years prior to the opening of the subway, the number being reduced to 25 in the same period after the subway was constructed. On December 3rd, 1912, 54,000 passed through the Mansion House subway of whom 33,000 were from the railway and 21,000 were crossing. During the same day 24,779 persons passed through the Blackfriars subway.

Recent Improvements in the City.—Under two recent Acts, viz., The City of London (Street Traffic) Act, 1909, and the City of London Various Powers Act, 1911, the City has power to make regulations dealing with every kind of vehicle, as to the route to be taken, the line to be kept, the use of streets by costers, the loading and unloading of coal, coke, beer casks, &c., on or across the footway. The effect of the new regulations has been of great advantage in helping to solve the serious problem of congestion and danger in the streets.

Inquests and the Softness of Juries.—In 92 per cent. of the inquests held, verdicts of accidental death without any rider were returned; in 2·3 per cent. were the drivers of vehicles censured; and in only 0·9 per cent. were verdicts of manslaughter returned. As soon as a man is in peril he becomes at once an object of sympathy. Even with benches of magistrates there is often a good deal of sympathy for the man brought before them, and both juries and magistrates are far too lenient.

Dangerous Driving.—An idea prevails that a conviction of dangerous driving cannot be obtained unless it can be proved that some person was actually endangered thereby. This view is quite erroneous.

Safety Guards on Trams and 'Buses.—The design of safety guard on the L.C.C. trams has proved very effective. In the last three years the guard was brought into action on 135 occasions and was unsuccessful in five cases only, in one of which a child was involved. The failure may have been due to the child's clothing. There were 121 cases in which people would have been killed but for the operation of the guard. A side-guard is considered impracticable and unnecessary on L.C.C. cars. In 1907-8 there was only one fatal accident per 14,000,000 passengers carried, in 1912 only one per 22,000,000.

Motor-'Bus Accident Record.—The fatalities in 1907 were 29 per 1,000 'buses, and in 1908, when the rivalry between the L.G.O. and the Road Car Co. was at its height, and racing and "nursing" were common practice, the fatalities rose to 54·7 per 1,000 'buses. The proportion fell in 1909, but has since risen to 62·6 in 1912.

The accidents per 1,000,000 miles run in 1912 were 2·14 for the 'buses, and 0·45 for the cars, or about one-fifth of the 'bus figures.

Competitive Working.—Evidence showed that 'buses run alongside trams in such a way as to prevent passengers entering or leaving the latter, and "numbers of people are afraid to travel in tramcars by reason of these omnibuses." The 'bus fares on tramway routes are in some cases half the fares for the same distance on routes where there are no trams.

Too Many 'Buses.—Each 'bus now carries on the average 60,000 fewer passengers a year than in 1910, and the same average number could be carried with 700 fewer 'buses.

Influence of Drink.—A constable is liable to be charged for "rendering himself unfit for duty through drink"; but a driver cannot be charged unless he is legally "drunk." Where a driver was so much under the influence of drink that he drove on to the pavement, he was not proceeded against, because the divisional surgeon could not say that the man was "drunk."

Speed.—No alteration in speed limit is recommended, but the Committee is of opinion that both tramcar and motor-omnibuses should be fitted as soon as practicable with some form of speed register.

Police Traps.—The practice of giving warning to other motorists of the existence of police traps has proved extremely prejudicial to the police in carrying out the duties of timing cars. Although this has, to some extent, been checked by a ruling of the High Court, the Committee suggests that in any contemplated legislation this class of offence should be specially provided for.

Unsound Vehicles.—It was stated in evidence that hundreds of vehicles in an unsound condition are deliberately sent out in the expectation that a breakdown may occur on the tramway tracks in circumstances which will enable the owner to secure compensation.

In 1903, a by-law, to deal with this state of things, was proposed by the L.C.C., but rejected by the Home Office, on the ground that its terms were unreasonable and lacking in certainty. The Committee regards the presence of unsound vehicles on the streets as a menace to public safety and considers it desirable that a by-law should be framed imposing penalties on any owner or driver who knowingly sends or takes an unsound vehicle into the streets.

General Recommendation.—The Committee is of opinion that the routes, time table and number of stage carriages, should be subject to regulations formed by County Councils and County Borough Councils, and confirmed by a new authority to be established as the New Traffic Branch of the Board of Trade. This New Traffic Branch should supersede or absorb the London Traffic Branch of the Board of Trade and should consist of a small number of specially qualified persons and the choice should not be limited to Government officials. Expert advice of the highest character should be put at its disposal.

IMPROVED AUTOMATIC STAIRCASE LIGHTING CONTROL.

Electric lighting of stairways in conjunction with automatic time switches is becoming very common, particularly in blocks of flats and tenements during late night hours. A person wishing to use the stairs switches on the lights by the aid of a push-button in a relay circuit, and, after a predetermined time, the lamps are automatically disconnected. A comparatively simple equipment is needed, and the convenience of the system to the occupants of the building is immense. By eliminating the use of matches on the stairs the fire risk is considerably reduced, and the automatic extinction of the lamps results in important current economy.

Modern automatic stair-lighting equipments almost invariably depend on the closing of an electromagnetic circuit from pushes on the various landings. The magnet armature closes the lamp circuit and actuates a clockwork train which opens the lamp circuit after a time interval which is regulable within limits. If the person using the stairs has not completed his journey, as may well be the case if he has several flights to ascend, he then finds himself in the dark and has to fumble for the next push-button before the lamps can be switched on for a further period. The search for the switch is likely to be prolonged, and even risky. In many cases, the lighting-control buttons are placed near the door bell pushes of neighbouring flats, so that, in the interests of all parties, a match has generally to be requisitioned, after all, where the above "automatic" control system is adopted.

To avoid such a *contretemps* and allow for human frailties—in the form of gossip by the way, avoirdupois and physical infirmity—while economising lighting to the maximum possible extent in the case of those persons capable of ascending the steps in standard time, a recent contributor to the *Elektrotechnischer Anzeiger* suggests an arrangement whereby a signal is given sufficiently in advance of the impending extinction of the lamps to enable the next push to be reached before darkness descends. The signal is given by placing resistance in series with the lamps, so that they are dimmed during the warning period. The import of the signal is unmistakable, even to the uninitiated, and it is a very simple matter to arrange the necessary electrical gear.

Referring to fig. 1, two controllers, I and II, are employed. Controller I is set for a shorter period than II (say, 2·5 min., as compared with 3·25 min.). On pressing any one of the series of landing buttons K, the electromagnets of both controllers are excited, the respective contacts M are closed, and the clockwork trains C are set in motion. Controller I connects the lamp circuit directly to the service terminals, but when its contacts are opened (after 2·5 min.), the lamps are still supplied for a further 0·75 min. through the resistance *r*, the pressure drop in which causes the lamps to be dimmed considerably. During the dimming period, there is time to reach the nearest press button K and reclose the field circuits of both electromagnets, if a further period of illumination is, for any reason, required.

The above system is only applicable to those controllers which can be restarted before the completion of the lighting period. In some cases, this cannot be done, and the arrangement shown in fig. 2 may then be employed. Controllers of this type are almost always provided with a special switch contact which temporarily disconnects the electromagnet coil during the lighting period, so that sticking or any continued pressing of the control pushes cannot cause overheating of the magnet winding or current wastage in this circuit. This special contact may be used to connect an auxiliary time switch which closes the lamp circuit through a dimming switch a short time after the main controller contacts are opened. The auxiliary time-switch may be of the strip or

mercury type, such as is largely used in connection with advertising signs. During the period in which the main controller contacts are closed, the field-circuit of the time-switch is closed by U, and, for a certain time after the latter contact is opened, the auxiliary switch contacts remain closed, and the lamps are supplied through the dimmer.

The dimming resistance should be so proportioned that it reduces the lamp current to about 75 per cent. of its normal value. The ballast resistance built for use with arc lamps may conveniently be used for dimming purposes, while a yet cheaper arrangement employs glow lamps as a dimming resistance. It is obviously possible to arrange that the stairway lamps shall be placed in pairs in series (instead of in simple parallel), during the warning period, but this arrangement would considerably increase the cost of the wiring and involve rather too severe dimming.

In figs. 1 and 2 it has been shown how the new system may be applied to stair-lighting controllers already on the market. If a special controller is to be built, the whole of the switching can be performed by a single apparatus, and it is indeed an easy matter to adapt the type of controller, shown in fig. 1, to this end. All that is needed is a sub-division of the end of one of the contact bars M (fig. 3), the gaps being bridged by sections of the dimming

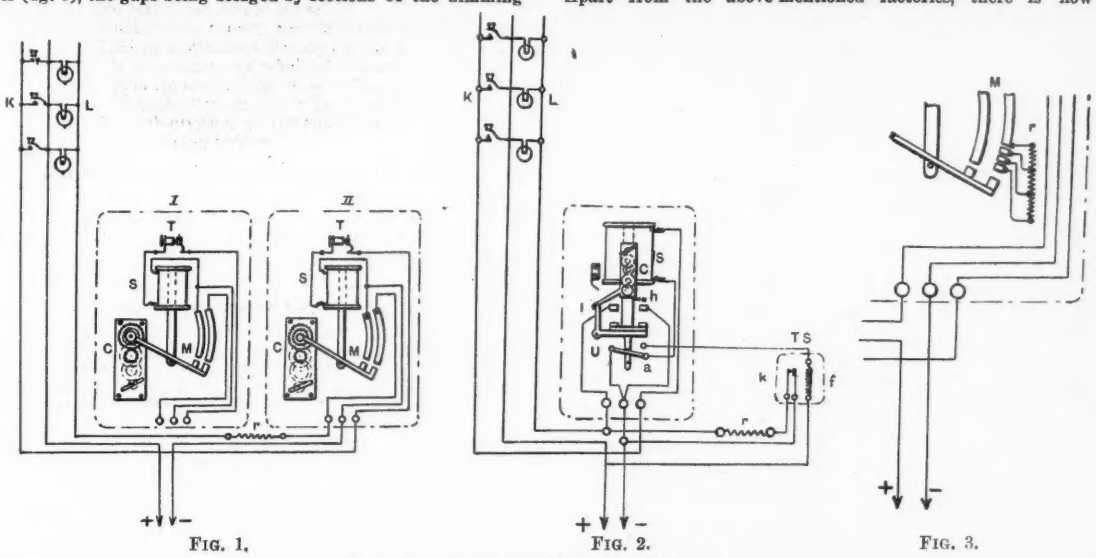


Fig. 1. Fig. 2. Fig. 3.

Automatic Staircase Lighting Control.

resistance *r*. Progressive dimming is then secured during the warning stage, and, by grading the time intervals and degree of dimming of the warning signals, the latter can be made very effective. If it is preferred to have only a single sudden dimming, only one division is made in M, and the whole dimming resistance is connected across this gap.

The suggested improvement in automatic stair-lighting switchgear should certainly increase the popularity and application of this convenient and economical system. The improved equipment described is quite suitable for installation in even small houses, and is cheap (particularly if installed at the time the house is built) in initial and working cost.—L. Crouch.

THE ELECTROCHEMICAL AND METALLURGICAL INDUSTRY IN NORWAY DURING 1912.*

While the value of imported raw materials and other goods for productive purposes during the first 10 years of this century rose from £7,400,000 to £13,300,000, or about 85 per cent., the value of industrial products exported during the same period increased by about 150 per cent., or from £2,800,000 to £7,000,000. At present the total capital invested as share capital in industrial concerns reaches the figure of £16,700,000, of which about £8,000,000 is Norwegian capital, about £2,800,000 is foreign, and £5,600,000 is partly Norwegian and partly foreign capital. The amount of foreign capital is estimated to represent about 30 per cent. of the total amount invested in industrial concerns, and it has chiefly been placed in electrochemical and mining undertakings. The electrical industry is of great importance to Norway. In June, 1911, there were 1,139 electrical power plants in use, with an equipment of 262,095 kw. During 1912 the first part of the scheme for harnessing the Rjukan Waterfalls was completed, which brought the aforesaid figure up to 370,000 kw., and if the capacity of all other plants which have been completed since 1911 be added, the total amount should by this time be about ½ million kw., of which some 200,000 kw. are used by the electrochemical industry. There are now to be harnessed three different rivers, viz., the waterfalls at Vamma, Matre and Tyin, each of which will be capable of producing about 80,000 h.p., while the question of harnessing the Nore Falls, which alone should produce about 170,000 h.p., will soon be considered.

The new nitrate industry in Norway has, during 1912, had an excellent year, and the economical results have been very satisfactory, which is not surprising in view of the demand for the products having been very brisk, while prices have been high. The greater portion of the production has been disposed of abroad; the rest has been used for inland consumption, so that the import of nitrates from Chile has almost completely ceased. The large power plant at the Rjukan Waterfalls was set in operation in May last, from which time the productive capacity was increased by 107,000 kw. The new plant has been found to work satisfactorily, and the work at the other factories has proceeded in the same way and without stoppage. The only disturbance that occurred was a small strike in June, which lasted, however, for only eight days.

It is thought that such stoppages may be avoided in future by improving the conditions for the men, and as a means of doing this, the companies have now decided to supply them with cottages, while other schemes for improvement are under consideration. Apart from the above-mentioned factories, there is now in course of erection in the neighbourhood of the town of Arendal another large plant for the manufacture of nitrides, which is going to employ 30,000 h.p. French capital is chiefly interested in this new enterprise.

As regards the carbide of calcium industry, the export of this product has increased very much, and amounted in 1912 to 64,208 tons with a value of £555,500. At the large manufactories at Odda, in Hardanger, part of the production is used as raw material for the manufacture of nitrates of lime.

The Hydro-Nitrogen Co. have carried out, at their factories at Notodden, experiments with a view to producing phosphates from appatite, which have given such good results, that it is now the intention to work the process for commercial purposes.

As regards the electrical smelting of iron ore, this industry has met with considerable difficulties during the year, and one of the new plants, the Hardanger Electrical Works, has shut down, because the process employed, viz., that of the Swedish Elektrometal, did not work satisfactorily with coke as fuel. In Sweden, however, where charcoal is available, the same process has turned out a great success. The production at the Hardanger Electrical Works amounted to 2,200 tons of pig-iron. At the Ulefos Iron Works a small electrical plant has been in operation, and has turned out 300 tons of pig-iron, which have been employed in the foundries of the works. This plant has been worked chiefly for experimental purposes, but it is the intention to erect large works there now.

The most hopeful development of this industry has, however, been made at the Tinfos Iron Works, although the plant was not completed before the end of the year. One furnace has been in operation for about half a year, and although several difficulties have had to be overcome, the results of the last month's working have been very satisfactory and encouraging. The process employed is a Norwegian process, invented by Engineer Bie-Lorentzen.

The Stavanger Electro-Steel Works, which have been built for the sole purpose of manufacturing steel from scrap-iron, were completed during the year, and so far the results have been very satisfactory. The plant has been built with a view to turning out about 6,000 tons of steel per year. The electrical steel furnace in the Yösingfjord, constructed according to Hiorth's patent, has only been worked periodically during the year.

The Hybinette process for the electrolytic production of copper has been acquired by a company, and been worked by the same at the Aamdal works with good results. The works have, however, been closed down, because the ore from the Aamdal Mines was not the most suitable for the process, while the situation of the works was not favourable for the importation of ore from elsewhere. The

* Partly from *Chem. Ztg.*

company has the intention to erect another plant for exploiting the process at a more convenient place. The production of ferro-silicon amounted to 6.493 tons in 1912, as against only 2,645 tons in 1909. The Meraker Electrical Smelting Works have recently taken up the manufacture of ferro-chrome.

Of zinc refining plants there are two, one at Trondhjem and the other at Sarpsborg. The raw material employed consists chiefly of imported zinc ore. The total production in 1912 amounted to 8,928 tons, the export value being £277,800, from which, however, has to be deducted the cost of the raw materials, which was £222,200.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Some E.A.C. Productions.

The Electrical Apparatus Co., Ltd., of Vauxhall Works, South Lambeth Road, S.W., have recently supplied a number of control pillars, one of which we illustrate in fig. 1, to a foreign railway.

Fig. 1.—E.A.C. Control Pillar.

Each pillar consists of cast-iron pedestal, and carries a non-automatic quick-break oil switch, totally enclosed fuse box, with porcelain handle, replaceable fuses, and a totally-enclosed air-break auto-transformer starter. These are bolted together, and no

Fig. 2.—Air Break Star-Delta Starter.

connections are exposed, the panels complying with the latest requirements.

We also illustrate the E.A.C. star-delta starter, the designs of which have recently been revised, and now embody various improvements which experience in this class of switch has shown to be desirable. These starters are made in two forms, air-break (fig. 2) and oil-immersed (fig. 3), both being totally enclosed and capable of being made dust-proof and water-tight if desired.

The insulation throughout consists of very substantial moulded mica, and all the starters are fitted with the well-known E.A.C.

Fig. 3.—Oil-Immersed Star-Delta Starter.

finger, which, besides being very durable, is extremely easy to repair or replace should this ever become necessary. Particular attention has been paid to making the starters easy to wire up and install.

Acid Proof Silica Lamps.

The Westinghouse Cooper Hewitt Co., Ltd., of 80, York Road, King's Cross, N., have recently put on the market an acid proof silica lamp, which is particularly adapted for use in chemical and galvanising works where corrosive vapours are present in the atmosphere. The housing of the lamp is of earthenware, and with

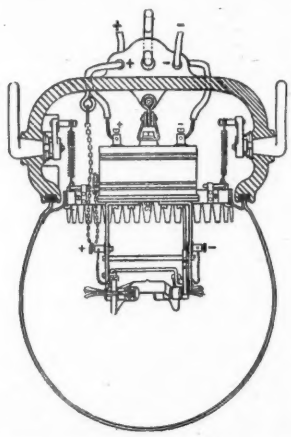


Fig. 4.—Westinghouse acid-proof Silica Lamp.

this the globe makes a tight joint; the lamp mechanism is of the standard pattern, as used in the other silica lamps made by this company.

The lamps are of 1,200 c.p. (110 volts), 3,000 and 1,500 c.p. (220 volts), and have an average life of 4,000 hours and a guaranteed minimum life of 1,000 hours.

An Emergency Oil Firing Device for Central Stations.

The employment of petroleum products as fuel, instead of coal, is rapidly increasing, as its advantages become more widely recognised. The price of fuel oil in this country alone prevents its more general application, but its use as a stand-by for steam raising in case of emergency, is at the present time receiving very considerable attention. When the necessary apparatus is fitted for using this fuel in conjunction with coal, the normal evaporation of the boilers can be increased by 30 per cent.

During recent tests, where a high air pressure for forced draught was available on a Yarrow type boiler, the evaporation was increased by 100 per cent. with a corresponding increase of steam per lb. of fuel burned of 35 per cent. At Wolverhampton electricity supply station some extensive tests have recently been made on a mechanically-fired Babcock & Wilcox boiler, when it was found that a 19 per cent. increased evaporation could be obtained without any alteration of the boiler as arranged for coal or other solid fuel.

Oil being a liquid, special appliances are required for its application, and unless this fuel can be used with scientifically designed apparatus, the results obtained are often far from satisfactory. The system which has been adopted at Wolver-

hampton is the result of many years of pioneer work by Mr. J. J. Kermode (Kermode's, Ltd.), Liverpool, and it is with a plant manufactured by Mr. Kermode's firm that the results quoted were obtained.

This firm have recently perfected a "power augmenter" specially designed for use in electrical power stations, which consists of a portable truck carrying an oil tank, also all the necessary valves for regulating the oil supply. On the truck is mounted one of the Kermode steam and induced air burners arranged so that it can by a simple movement be set at any reasonable angle. In this way the oil spray can be directed as required in order to assist a coal fire in the combustion chamber of any type of boiler. This portable plant can be applied to any furnace which it is desired to force temporarily in order to meet sudden demands for power, thus obviating the necessity of keeping boilers under banked fires to meet peak loads.

The apparatus shows a considerable saving in the cost of fuel in addition to providing a reliable means of at once augmenting the steam production as required.

Weight for weight the calorific value of oil fuel as compared with the best average Welsh coal is about as 14 : 6, or, in other words, 9 lb. of liquid fuel will evaporate the same quantity of water as 14 lb. of coal. In addition to this obvious economy, by means of properly designed atomisers it is possible to obtain 83 per cent. of the theoretical calorific value of the fuel used, whereas with coal the large proportion of fuel passes away unconsumed in the form of soot and smoke. A further saving is effected as no labour is required for removing the ashes or clinker. As an instance of the value of oil firing in emergency, it may be noted that many of the leading fire brigades in England and abroad now use this fuel on their steam-driven engines.

The Belling Electric Fire.

Messrs. Belling & Co., of Derby Road, Edmonton, N., have recently issued a new list calling attention to their well-known "Electric fires," which are specially adapted for domestic use. We understand that some marked improvements have been introduced on the last season's productions, viz, each bar is in parallel on the full voltage; the bars are fitted with a new type of clip, giving perfect contact and doing away with any connecting up when fitting a new bar; a rotating switch is used, sunk flush with the casting, and thus preventing damage in transit, &c. The list illustrates the uses of the Belling fire, and will gladly be supplied to electricity departments on application.

REVIEWS.

Liquid Air, Oxygen, Nitrogen. By G. Claude, translated by H. E. P. Cottrell. 1913. London: J. & A. Churchill. Price 18s. net.

Being written by a French scientific man, it might be expected that this book should contain lighter touches than are usually to be found in an English scientific work. We have not been privileged to read it in the original, but from the general style of this translation, we should judge that it is no mere paraphrase, but that an endeavour has been made to preserve the idiosyncrasies of the French author, either by will or unconsciously. Anyway, the result is a treatise on gaseous liquefactions steeped from end to end with humour, intermingled, regretfully be it said, with three persistent and painful faults in its English; to wit, a heavy crop of infinitives, split not always with single words, but with even short phrases like heavy parenthetic German; numerous instances of "and which" and some of that non-existent word "firstly." These three faults seem to be particularly favoured by engineers. We can, however, almost forgive them in this book because of its happy virtues.

Would that all scientific books could possess something at least of the style of Claude! He treats gaseous liquefactions as a joke and its phenomena as comic interludes. Gases are brought forward as personalities. Temperatures are introduced as frightfully or fearfully low, reminding us of the chatter of a tennis club, or of two rival clubs which played on a certain suburban field.

In Claude's book we find an illustration, the legend to which and index thereof, see page 22, is "Pitiable Behaviour of an Erstwhile Permanent Gas."

A gas is referred to as having been reduced compulsorily to liquefy, and other gases are convicted of the same "abject" behaviour. One reads and laughs, and reads on, interested in the question of the sanctum of the permanent gases to see the mere vapours kicked like poor cowards from the place as mere sham permanencies after all; and, given time, the reader will be carried right through the book, and learn the history and the present status of the subject, imbibe something of the possibilities that the future will yield, and the present, indeed, is already offering from the fractional distillation of mixed low temperature liquids, as he will already regard these abject gases. And he will see, too, the arrant follies of those liquid air enthusiasts who were so full of the motive-power fallacy in connection with liquid air.

To the electrician, one of the more interesting phenomena of low temperature is the enormous increase of electrical conductivity of metals, a fact reasonably to be anticipated from the opposite effect. Thus copper gains fiftyfold if cooled by liquid air. Liquid hydrogen boils at $-252°$ C., and would increase conductivity one hundred times. What a drop there would be in the copper market! In mechanical work shrink fits could be made by reducing the diameter of the inner piece, combined, perhaps, with mere hot water or steam heating of the outer piece, so avoiding dirt, dust and oxidation. And, though matter appears to become dead at low temperatures, even to the extent of the lying down together of the sulphuric lion and the potassium lamb, yet if solid fluorine be placed in liquid hydrogen there is spontaneous and violently explosive combination. What is the hidden meaning of this curious and strange exception to an otherwise, apparently thus far, universal rule?

At page 50 the critical temperature of a gas is given as that *below* which it is impossible to liquefy by pressure alone. Should not this read *above*?

The book is well illustrated with diagrams and with skeleton figures of apparatus used in liquefaction work, and also with half tones of the interiors of some of the leading works, in which oxygen and nitrogen are being produced from liquid air. The process, as here fully described, is most interesting.

Theory and Calculation of Electric Currents. By J. L. La Cour and O. S. Bragstad. London: Longmans, Green & Co. Price 16s. net.

This is the first volume of a projected series of works on the Elements of Electrical Engineering to be issued by Messrs. Longmans, Green & Co., under the general editorship of Mr. J. L. La Cour. This book is based upon the well-known work of the same authors, which forms the first volume of the "Wechselstromtechnik," edited by the late Prof. Arnold, and now taken over by Mr. La Cour. We are told in the authors' preface that the present volume is intended to serve as a text-book of that part of the theory of alternating currents and the allied branches of the theory of electricity which are necessary for a complete study of heavy-current electrical engineering. This is an excellent summary in a few words of the scope of the book, to which might be added the further statement that the treatment throughout is mainly of an analytical and mathematical character, and that it is confined to the consideration of electrical and magnetic circuits, without specific reference to particular forms of electrical machinery in which they occur.

The names of the authors are a sufficient guarantee that a work of this scope has been well carried out, and that its publication is a matter of importance to the electrical engineering world. The fact that this book on electrical theory has been written by engineers and for engineers, gives it a very special significance. We may be sure that it cannot fail to exert an important influence towards the adoption of some generally accepted system of calculation and of notation, which we may hope some day to see adopted by electrical engineers as being the best for the particular type of problems with which they have to deal.

Several works have been produced dealing with the theory of electric currents by authors whose point of view has been mainly that of the physicist or of the mathematician. Valuable as have often been the results arrived at by these writers, in many cases they have required further interpretation at the hands of practical engineers before they could be applied to the solution of commercial problems.

In their treatment of alternating-current problems, the

authors make use of the symbolic system of notation which is familiar to students of Steinmetz's works, while they also employ graphical constructions to a considerable extent.

An introductory chapter deals with the fundamental mathematical theory of continuous currents, magnetic fields, electromagnetism, electromagnetic induction, and complex quantities. These last are treated here purely as mathematical abstractions, and it is tacitly assumed that the results of the operations of addition, multiplication, &c., are equally applicable, whether the symbols represent the co-ordinates of a point, pure numbers, or the components of a vector. When the results come to be applied to actual electrical problems, it is somewhat disconcerting to the student to find that these rules may be applied when multiplying a vector of impedance by a vector of current in order to obtain the vector of E.M.F., but that when he wishes to calculate the power in a circuit by multiplication of the vector of voltage by the vector of current, another kind of rule has to be adopted for the multiplication.

Chapter I deals with simple alternating currents and their graphic and symbolic representation. The symbolic expression for the power in a circuit is here shown as being obtained by multiplication of the symbolic expression for the pressure vector, by the symbolic expression for the image of the current vector with respect to the axis of real values. It is interesting to compare this rule with that of Steinmetz, which is based on the idea that the product of two alternating quantities gives rise to an alternating quantity of double frequency, so that the significance of the symbol "j" is altered by the multiplication.

The next two chapters deal with the physical properties of alternating-current circuits, and with the analytical and graphical methods of representation. Circle diagrams are given for the electric circuit, and the use of geometrical inversion in changing from admittance to impedance, &c., is explained. Considerable use is made in the latter chapters of this method of inversion. Geometrical and analytical treatments are closely interwoven. In fact, for some readers the reasoning would have been easier to follow if geometrical and analytical proofs had been kept somewhat more distinct from one another and employed as alternatives, or as supplementary to one another.

Further chapters deal with series and parallel circuits, magnetically interlinked circuits, no-load and short-circuit diagrams, and with circuit load diagrams.

Distorted wave-forms are fully dealt with, both in connection with single-phase and polyphase circuits. A chapter on the measurement of electric currents gives rather briefly the underlying principles of some of the more important types of measuring instruments and is followed by an excellent chapter on the magnetic properties of iron. One is a little inclined to regret that the chapter which deals with the fundamental principles of electrostatics was not extended, so as to lead up to the problems of high-tension lines, but this would perhaps have opened too wide a field. Two chapters on the electric properties of dielectrics and the constants of electric conductors conclude the volume.

Without doubt the work will prove a valuable book of reference on points of theory and on methods of calculation to the experienced engineer, who will find it a mine of information as to the treatment of problems of an advanced character. To the advanced student of electrical engineering, it should prove a text-book of that rare type which deserves close study during his college career and a prominent place on his book-shelf in after years; for it will be long before a book such as this will have to be considered out-of-date, or deserve to be banished in order to make room for a successor.—C. F. S.

Single-Phase Commutator Motors. By F. Creedy. London: Constable & Co., Ltd. Price 7s. 6d. net.

Mr. Creedy's earlier work in connection with the theory of single-phase alternating-current motors is already well known and must entitle any book from his hand on this subject to a respectful and interested reception.

A perusal of the book before us will, we think, induce readers who are interested in the subject of single-phase motors, whether as students or designers, to go further and to give the work a most cordial welcome, and to accord it a more than usually careful study.

The book contains 10 chapters, which occupy just 100 pages, so that it might be thought, at first, that only a short time would be necessary in order fully to master it. Although, the method of treatment is simple and involves hardly any mathematical or geometrical difficulties, likely to trouble the reader who has made a study of alternating-current machines, the book is so concisely written and contains so much material which will appear unfamiliar to the reader that it will be found to contain much food for careful thought and will require close attention at every step.

Stated briefly, the book sets forth a general method, whereby the action of all types of single-phase commutator motors may be studied. Mr. Creedy's method is founded on an analysis by means of vectors, so that his treatment is in the main a graphic one, in connection with which the ordinary symbolic notation can often be used with advantage.

The essential departure from the ordinary treatment of alternating-current problems lies in the special characteristics possessed by the vectors used by Mr. Creedy. Instead of being rotating vectors, which represent phase relations by their relative angular displacements, the vectors employed in Mr. Creedy's work are regarded as alternating in value, and as representing actual space displacements by the angles at which they are drawn. Thus, a vector of flux will indicate an alternating field whose axis is fixed, and which has the direction indicated by the inclination at which the vector is drawn. Since the actual field of a single-phase motor is generally made up of two alternating fields, each having a fixed axis, it becomes necessary to combine such fields, in order to obtain the resultant elliptical field, which acts on the armature.

It will be obvious that the working out of a complete system for deriving the relationships between current, voltages and fluxes, when these are represented in a manner which differs fundamentally from that usually employed, must have involved much labour on the part of the author, and that for the reader much thought is necessary to enable him to adapt his views to the new conceptions with which he is faced throughout the book.

It is a valuable achievement to have developed a system which is comparatively simple, and at the same time is of general and practical utility.

The derivation and properties of the ellipse necessarily play an important part in the graphical treatment of a type of motor in which an elliptical rotating field is characteristic, when Mr. Creedy's form of diagram is employed. An appendix gives some of the geometrical properties of the ellipse, which have a bearing on the working of the problems arising in the body of the book.

The last chapter gives a comparison of the results arrived at by experiment with those derived from the previously given theory. This chapter should prove of special value to the college student, since, as Mr. Creedy points out, many technical colleges are equipped with single-phase motors of which little practical use is made, because a full comprehension of the action of alternating-current commutator motors lies outside the limits of an ordinary college course. By employing the methods given in this last chapter, it is not difficult to plot curves of field distribution by direct experiment, without a full knowledge of the theory of the motor, and in this way to obtain some clear ideas of its operation.

Any new method of representation needs considerable practice and thought before its value can be fully realised and assessed. Without being able to judge Mr. Creedy's methods from the standpoint of actual application in practice, it is possible, however, to congratulate him on having developed a system of representation which is general, which is simple and which is at the same time sufficiently exact for practical purposes.

Perhaps Mr. Creedy will allow the reviewer to mention, in conclusion, one further matter for congratulation, of a more personal nature. With the recollection of hours spent in following out the construction and description of earlier

diagrams of Mr. Creedy's, the reviewer ventures to offer his humble and grateful acknowledgments for the much clearer and simpler style of presentation, as well as for the important simplification of the diagrams which mark a real advance on Mr. Creedy's earlier work.

BUSINESS NOTES.

Bankruptcy Proceedings.—Joseph Swainson (trading as J. Swainson & Co.), electrical contractor, 22, Booth Street, Manchester, Lancashire.—The first meeting of creditors herein was held on August 14th at the offices of the Official Receiver, Byrom Street, Manchester. The total gross liabilities amounted to £1,489, of which £1,369 is expected to rank for dividend. The liabilities due to 60 unsecured creditors amount to £1,023, and three creditors who are partially secured claim £433, the value of their securities being £88. Preferential claims amount to £30 19s. 6d. The assets include stock-in-trade £78, work in progress valued at £65, good book debts £120, and doubtful debts representing £227. The deficiency disclosed amounts to £1,044. Debtor attributed his failure to losses on contracts, bad trade, special allowances to obtain cash, bad debts, and increased cost of material after acceptance of contracts. Mr. A. Yearsley, of Messrs. Trotter, Davis and Yearsley, accountants, Manchester, was appointed trustee, with a committee of inspection consisting of Messrs. R. H. Smethurst (Baxendale & Co.), Jas. K. Cooper (Drennan & Cooper), and Douglas C. Bate. The following are creditors :—

Bowler & Brown, Ltd. ..	£44	Baxendale & Co.	£120
Sloan Electrical Co.	40	British Union Lamp Co., Ltd.	73
Central Electrical Co. ..	21	Sandycroft, Ltd.	38
Northern Accessories Co. ..	21	Griffiths & Son	16
Drennan & Cooper	105	Bedford Steel End Co. ..	22
Newtons, Ltd.	20	Claff, S.	100
Douglas C. Bate	63	Turner, M. S.	143

Wyndham Wadsworth, engineer's agent and dealer in electrical accessories, 16, John Dalton Street, Manchester.—The public examination of this debtor was held at the Court House, Quay Street, Manchester, on August 15th, when the statement of affairs showed liabilities amounting to £591, and an estimated deficiency of £498. Debtor attributed his failure to lack of capital, heavy interest on loans from moneylenders, heavy travelling expenses, and moneys paid as guarantor to his brother. In answer to the Assistant Official Receiver, debtor said he commenced business in July, 1910, when he was 32 years of age, as agent for the sale of lock-washers, such as were used by large engineers. He had no capital excepting a loan of £50 from the company he represented. Being pressed for money he obtained loans from moneylenders, paying as much as 20 per cent. for a fortnight's accommodation. Of the unsecured liabilities, £215 was for money-lending transactions, the balance being wholly for goods supplied. He first became aware of his financial position last December, but continued to trade in the hope that matters would right themselves. The Registrar observed that the debtor appeared to have been paying for loans at the rate of 1,000 per cent. interest per annum. The examination was closed.

W. R. Wedge, electrical engineer, The Arcade, Northampton.—The first meeting of creditors herein was held at the Official Receiver's office, The Parade, Northampton, last week, when the matter was left with the Official Receiver, who will act as trustee.

F. L. Woilliard-Rigg, and H. E. Scarborough (Woilliard, Scarborough & Co., Halifax), electrical and mechanical engineers.—August 30th is the last day for receipt of proofs for dividend. W. Durrance, trustee, 12, Duke Street, Bradford.

For Sale.—The Devon County Asylum is offering for disposal two second-hand De Laval steam turbines and dynamos, of which particulars are given in our advertisement pages to-day.

Messrs. Percy Huddleston & Co. will, from August 25th to 29th, offer for sale by tender a quantity of electrical material and apparatus. Particulars are given in our advertisement pages to-day.

German Activity in China.—A Reuter dispatch from Peking (in the *Financial Times*) states that the German firm of Carlowitz have, through their Hong-Kong manager, who is also a director of the Hong-Kong and Shanghai Bank, offered to advance to the Governor of Yunnan £3,000,000 for the construction of a railway from Yunnan-fu eastwards to Poseting, on the West River. By the terms of the proposed concession, the German firm will both furnish the railway material and finance the undertaking. Messrs. Carlowitz, who represent Krupps, are to have for a period of 20 years a monopoly of all Government contracts for the supply of arms and ammunition and all mining and other machinery, in addition to an extensive series of mining concessions along the projected railway. The firm states that the proposal has been approved by the German Legation in Peking, but the latter denies all knowledge of the matter.

International Electrical Competition.—The subject of the respective manufacturing positions of the three principal producing countries is discussed in an article by Dr. Arthur Lietke in the *Mitteilungen*, of the Siemens & Halske Co. and the Siemens-Schuckert Works. Assuming one mark to represent one shilling, the author states that the exports of electrical products from Germany in 1912 amounted to £13,000,000, or about 22 per cent. of the value of the total domestic production, which is estimated at £60,000,000. On the other hand, Great Britain and the United States are credited with total exports of similar products of the value of £6,500,000 and £5,000,000 respectively in 1912, or about 30 per cent. and 7 per cent. of the total production, which is given as £22,500,000 for Great Britain, and £75,000,000 for the United States. The consumption of electrical products *per capita* of the population on the basis of these figures is put at 16s. for Germany and the United States, as compared with 8s. in the case of Great Britain.

The favourable geographical situation of Germany in Europe is rightly claimed to be largely responsible for the considerable exports realised by that country, which is also asserted to have been the first to appear technically competent in international markets; and about 70 per cent. of the total exports are to countries in other parts of Europe. In the case of Great Britain, which still imports electrical products of the value of £2,500,000, of which £1,700,000 emanate from Germany, it is stated that one-half of the total exports finds a sale in the British Colonies. On the other hand, the United States firms are not in the fortunate position of possessing such preferential markets as Germany and Great Britain, and this explains the smallness of the American exports in relation to the total production in the United States. At the same time it is submitted that the whole of North America down to Panama, including the West Indies, has become the principal market of the United States in recent years.

The first position in the oversea export trade—that is to say to countries outside of Europe—is occupied by Great Britain, which exhibits a total value of £5,250,000, whereas the oversea exports of the United States are calculated at £4,250,000, and those of Germany at £3,750,000, making an aggregate of £13,250,000. These figures show that Germany, whose total exports exceed in value those of her two principal competitors combined, is considerably behind-hand in the trans-marine export trade. The only markets, it is further stated, in which not one of the three countries enjoys special preference, are China and Japan and South America. These countries absorbed electrical products of a total of £5,750,000 in 1912, of which Germany claims 45 per cent., 30 per cent. is allotted to the United States, and the balance of 25 per cent. to Great Britain. It is added, in conclusion, that from the point of view of weight, the total exports from Germany have advanced from 97,000 tons in 1909 to 140,000 tons in 1912, or an increase of 45 per cent., and 44,000 tons, or 30 per cent. of the latter, was formed of oversea exports. The advance in the value in the same period of years has been 30 per cent., or an augmentation of 10 per cent. per annum.

Book Notices.—"Engineering as a Profession." By A. P. M. Fleming and R. W. Bailey. London: John Long, Ltd. Price 2s. 6d. net.

"English and German Technical Terms for Engineers and Manufacturers." By J. G. Horner and O. Holtzmann. London: Crosby Lockwood & Son. Price 3s. net.

"*Transactions* of the University of Toronto Engineering Society." Vol. VIII, No. 3. July, 1913. Toronto: The Society.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXII, No. 8. August, 1913. New York: The Society. Price $1.

"*Journal* of the Franklin Institute." Vol. CLXXVI, No. 2. August, 1913. Philadelphia: The Institute. Price 50 cents.

"*Transactions* of the Illuminating Engineering Society." Vol. VIII, No. 6. June, 1913. New York: The Society. Price 75 cents.

"*Proceedings* of the Engineers' Club of Philadelphia." Vol. XXX, No. 3. July, 1913. Philadelphia: The Club.

"The Physical Review." Vol. II, No. 1. July, 1913. Lancaster, Pa.: The American Physical Society.

"Year-Book of the Michigan College of Mines, 1912-13." Houghton, Michigan: The College.

"Congrès des Ingénieurs Electriciens d'Angleterre et de France tenure a Paris du 21 au 24 Mai, 1913." Paris: Gauthier-Villars.

"*Bulletin* of the Association des Ingenieurs Electriciens." Vol. XIII, No. 5. May, 1913. Liége: The Association.

"Revue Mensuelle de Radiotélégraphie and Radiotéléphonie." July, 1913. Vallenciennes: G. Hollande. Price 75 cents.

"Atti della Associazonie Elettrotecnica Italiana. Vol. XVII, No. 14. July 31st, 1913. Milan: Stucchi, Ceretti & C. Price L. 1.50.

"*Bulletin* de la Sociedad de Fomenti Fabril." Vol. XXX, No. 7, July 1st, 1913. Santiago, Chile: The Society.

"Telephone Erection and Maintenance." By H. G. White. London: S. Rentell & Co., Ltd. Price 1s. 6d. net.

Dissolutions and Liquidations.—Traction Supplies Co., Ltd.—A meeting is called for September 23rd at 50, Frederick Street, Sunderland, to hear an account of the winding up from the liquidator, Mr. T. Metcalf.

Redfern, Robins & Co., electrical experts and mechanical engineers, 93½, Hurst Street, Birmingham.—Messrs. J. S. J. Redfern and H. W. C. Robins have dissolved partnership. Mr. Redfern will attend to debts and continue the business as Redfern & Co.

British Electromobile Co., Ltd.—A meeting of creditors is called for August 25th at 1, Queen Victoria Street, London, E.C.

Mexican Fuel & Power Co., Ltd.—Creditors must send particulars of their debts, &c., to the liquidator, Mr. R. C. F. Chichester, 13, Basinghall Street, E.C., by September 14th.

Catalogues Wanted.—Electrical catalogues and electrical information are wanted by Mr. Luis A. Escobar, Empresa Electrica de Tacna, Tacna, Chile.

Catalogues and Lists.—Messrs. Falk, Stadelmann and Co., Ltd., 83-87, Farringdon Road, London, E.C.—Two new catalogues have been issued. No. 359 is a production of close upon 300 pages, in which a very wide and choice variety of electric light fittings, and sundries for use in connection therewith, are illustrated and priced. A glazed paper is used, and the illustrations show up effectively. The ground covered is so large that we shall not be expected to indicate the contents in detail, but we may say that there are many admirable and artistic designs included, which it is a pleasure to study even merely as catalogue prints. Some prominence is given to French productions, a class of goods which we understand, is somewhat of a new departure for the firm. The collection of English fittings and designs has been materially amplified, and a section has been introduced dealing separately with indirect and semi-direct lighting. The range of statuary has been almost doubled, and the firm have an excellent assortment and large stock of this class of goods. Several pages are devoted to illustrations of a few representative illuminated advertising signs and illuminated facia, a novelty in the latter connection being shown in the form of "Lumate" facia. Outdoor lanterns, for both shop and street lighting, are listed, as is also the necessary gear wherewith to install them. Every line in the catalogue is stocked. The second publication received from Messrs. Falk, Stadelmann is a 150-page catalogue (No. 354) of electrical accessories, containing illustrations and prices of a host of manufactures, including numerous devices, all sorts of lamps, cables, fans, conduits, carbons, and so on; indeed, it is claimed that nothing in the nature of wiremen's sundries has been omitted.

Messrs. J. H. Holmes & Co., Newcastle-on-Tyne.—New catalogue of 44 pages, containing specification and description of their "Castle" W type motors and dynamos. A great deal of tabular information is included giving outputs, prices, weights and shipping dimensions, code-words, &c., while directions for coupling up motors, and useful general notes, also appear. The catalogue contains a number of half-tone illustrations of the machines, also of Holmes-Clayton A.C. machinery.

Messrs. Wm. McGeoch & Co., 28, West Campbell Street, Glasgow.—Fifty-six-page catalogue of designs of electric light fittings, including hall lanterns, electroliers, shade pendants, single drop and bedroom pendants, ceiling fittings, table standards, billiard fittings and bronze figures. The book is prepared especially for domestic installation requirements, but, as our readers know, Messrs. McGeoch make fittings for all classes of buildings. Prices are given of all the designs listed.

Messrs. Rose Bros., 38 and 39, Beech Street, London, E.C.—16 pp. illustrated and priced supplementary catalogue of electric pocket lamps, cycle and hand lamps, batteries and bulbs, electric heaters, electric motor horns, boys' scientific sets, and other sundries.

Messrs. Siemens Bros. & Co., Ltd., Woolwich.—Three new fire-alarm pamphlets. No. 600 (20 pages) contains a detailed and excellently illustrated description of the Siemens dial indicator fire-alarm system; No. 601 (24 pages) deals in similar style with the Siemens recording fire-alarm systems; No. 602 is a four-page leaflet giving a list of places in all parts of the world where the firm's fire-alarm installations are in service.

Messrs. Armstrong & Co., 110, Cannon Street, London, E.C.—Illustrated list of bronze relief name-plates for electrical, machinery, and other purposes.

Messrs. Baxendale Brothers, 96, Whitechapel, Liverpool.—Twenty-four-page net price list of batteries, bells, cables, carbons, conduit and other fittings, cinematograph supplies, electric vibrators, and hot and cold-air douche, &c.

Messrs. Krupka & Jacoby, Ltd., Chapter Street, Westminster, London.—Price lists of Osram, Mazda and tantalum lamps.

The British Thomson-Houston Co., Ltd., Rugby.—Two new price lists: No. 5,000 (36 pp.) deals very fully, both descriptively and by illustrations and in tabular data form, with the B.T.H. controllers and resistances for industrial purposes. No. 5,001 (16 pp.) contains an account in similar form of their controllers and resistances for haulage service in coal mines.

Herr. Hans. Fickenscher, Ritterstr. 31, Berlin.—Twenty-page illustrated price list of hanging lamps, lustres, prism shades, electric table lamps, ceiling lighting, prism fittings, &c.

Messrs. Edwin A. Mansfield & Co., 12, Beckenham Road, New Brighton.—Twenty-four-page pamphlet containing descriptions and illustrations of their wireless cable testers, clock-work interrupter and detector coil, also their wireless pipe locator. Testimonials received from a number of American telephone companies which have used the testers are published.

Mr. O. N. Beck, 11, Queen Victoria Street, London, E.C.—Four-page pamphlet, fully describing and showing by means of very clear and detailed illustrations, the "Vulcan" patent blow-off valve.

Messrs. David Shanks & Co., Ltd., 115, Wainwright Street, Aston, Birmingham.—Twenty-four-page catalogue of electric light fittings for theatres, picture houses, public halls, &c. Special attention has been given to indirect and semi-indirect lighting, and the contents include examples of metal, real alabaster and imitation bowl fittings, such as have been supplied for leading buildings of the classes named, for auditorium, orchestra, vestibule, ounge and tea-room lighting. Illuminated signs for inside and outside service, also chair reflectors, are included in the list.

Mr. S. Utting, 4, St. Mary Axe, London, E.C.—Thirty-two-page illustrated catalogue, giving a very full account of the Prat system of induced draught, its construction, advantages in fuel economy and low power consumption, simplicity, capital and working costs, also its application to brick chimneys. The pictures show numerous works on the Continent where the Prat system is installed.

Messrs. Schoen Bros., 29-30, Cock Lane, Snow Hill, London, E.C.—Catalogue of 56 pages, giving illustrations and prices of a variety of electrical manufactures, including electric bells, indicators, batteries, terminals, pushes, switches, pocket lamps and lamp-cases, miniature lighting accessories, inspection, cycle and motor lamps, small dynamos and motors, medical coils, toy trains and trams, wireless telegraphy experimental apparatus, &c.

Rubber.—There has been a much more cheerful appearance about the market for crude rubber within the last couple of weeks, and it would almost seem that the actual merits of the article—for it really has merits—were beginning to assert themselves again. The last series of public sales in London went off with a distinctly firmer tone, and altogether the market wears a better appearance, as if the forced selling were over, and intrinsic circumstances were beginning to assert themselves. This is far from saying, however, that there can be any important advance based on merits. No doubt there is room for a small improvement, but the days of the boom have gone, and, it is much to be hoped, will not return. The really satisfactory thing about the market is that, statistically, the position leaves very little to be desired, the ever-increasing supplies all passing into consumption, while there are certain directions in which reduced output is notified. It is exceedingly doubtful if rubber can be collected from wild sources at a profit based on current selling prices of plantation grades, while the production of guayule in Mexico has pretty well ceased, not only on account of the revolutionary disturbances, but because of the threatened extermination of the plant from which it is produced. The reduction in the price of rubber has without a doubt enormously stimulated consumption, which is now on such a thoroughly sound footing, that probably nothing more will be heard of the scheme mooted a few months ago by which the plantation companies of the Middle East were to set aside a portion of their production to be sold at a big discount from the current rates, to consumers willing to enter into an arrangement to use it only in the development of new uses for the commodity. The market price of rubber is quite low enough to-day to permit of all reasonable experimental work in the ordinary course of business, and that consumers are availing themselves of their opportunities is abundantly clear from the way in which the arrivals are going into consumption. The longer that hard Para is held at an artifically high figure by manipulation, the more quickly will the merits of plantation grades force themselves home upon the trade, and the worse will it be in the long run for the collectors of wild rubber in Brazil. The use of rubber for flooring has enormous possibilities, and it is interesting to record the fact that the London Metal Exchange is the first London commercial centre to wake up to the advantages to be derived from its introduction as a sound deadener. The contract for the flooring of the Exchange with rubber has been signed, and probably other exchanges will follow suit when the advantages derived by the Metal Exchange are fully appreciated.

Lead.—Without any actual alteration in the position, the appearance of the Lead Market has been of late somewhat less stiff, especially as regards near deliveries, where some depreciation has been sustained in consequence of an easing in the position, arising out of pretty heavy arrivals reducing the acute phases of the situation. The price of distant deliveries has not suffered to anything like the same extent, and it is regarded with much satisfaction that the prices of prompt and forward metal should now more nearly approximate each other. Big divergencies in prices of this sort always breed distrust on the part of consumers, and, thanks to the reduced premium on near stuffs, a rather more confident air prevails. At the same time there is no desire to buy ahead of requirements, and the trade passing with the rollers remains very small, though, as some compensation for this, there is still a steady business doing with the electrical branches. All the lead which becomes available finds a home readily enough, but there has, the last week or so, been just about enough coming in to relieve the acute shortage, and this is a good thing, for unduly high prices always react disadvantageously upon consumption. Some talk has been heard as to a probable relaxation in the unrest in Mexico, but it amounts to nothing more than the expression of pious hopes that the end of the revolutionary movement may be at hand. Actually the news from Torreon is no better, although the siege of the place has been raised, with, it is said, heavy losses to the rebels. All the news, however, which filters through comes from New York, and should be received with the very greatest scepticism in view of its tainted source. As a matter of fact, apart from the knowledge that mineral production throughout most of the States of Mexico is practically suspended, as it has been for months, there is no definite knowledge to be obtained from any independent channel.

The Shops' Act.—Mr. Frank White, chief inspector in the Bradford Health Department, in his annual report issued last week-end, states that the Shops' Act, 1912, added considerably to the duties of inspectors, and, like many other Acts of Parliament, he says, is full of shortcomings. A notable oversight which he quotes is the failure to fix the number of hours during which a shop assistant may be employed. Since the coming into force of the Act, the day and night inspections of shops have numbered 7,576, and in 630 cases it has been found that no notice specifying the closing day was being exhibited, whilst in 15 cases assistants were found to be employed after 1.30 p.m. on the day appointed for their half-holiday.

Aster Engines.—The Aster Engineering Co., Ltd., have recently achieved a number of successes in motor-boat racing events by the Aster 12-14 H.P. marine engine.

Trade Announcements.—The Electrical and Incandescent Stores have removed to larger premises at 28, Burton Street, Nottingham.

The Siberian Steamship, Manufacturing and Trading Co., Ltd., have removed from 117, Kensington High Street, W., to 4, Cullum Street, London, E.C.

Messrs. T. M. Johns & Co. have removed their offices and works to more extensive premises at 39, Flora Street, Plymouth, where they are equipped for all kinds of electrical repairs and welding by the oxy-acetylene process.

Messrs. W. G. Watson & Co., Ltd., of Sydney, have opened an office for a short time in London, with the object of buying electrical goods for the Australian market. They will be glad to see any of the trade or manufacturers who wish to do business with them, at 41, Cheapside, London, E.C., where a list of requirements can be inspected.

Messrs. Kelvin & James White, Ltd., of Glasgow, announce that with the object of avoiding confusion which has frequently arisen between the name of their company and that of another firm of nautical instrument makers with which they have no connection, and also of rendering the firm's name more distinctive by including in it a reference to two of the present directors, the name of the company has, as from July 30th, been changed to Kelvin, Bottomley & Baird, Ltd. The name of Bottomley has for over 30 years been connected with the business now carried on by this company. Dr. J. T. Bottomley, LL.D., F.R.S., the present chairman, is a nephew of the late Lord Kelvin, the founder of the company, and inventor of the well-known navigational and electrical instruments which bear his name. Mr. Alfred W. Baird, a director, whose name also now appears in the style of the company, entered Lord Kelvin's service 29 years ago, and, later, joined the company on its formation. In the compass-adjusting department he is now ably assisted by a staff of competent adjusters, whom he has personally trained. In addition, Mr. Baird also supervises generally the outside business of the company. The registered address is unaltered.

The *Australasian Record* states that by the creation of 30,000 new shares of £1 each, the capital of Messrs. Haes & Eggers, Ltd., electrical and mechanical engineers, of 163, Clarence Street, Sydney, has been increased to £40,000.

The Electrical Apparatus Co., Ltd. — The meeting of creditors, called for August 29th, is that of the old company, and is a purely formal affair, the business, as our readers will remember, having been transferred to a new company bearing the same title which made a public issue of capital last month.

Annual Sports.—On Saturday, August 16th, Messrs. A. Reyrolle & Co.'s employés held their annual sports at Hebburn, before a large number of spectators. The games commenced at 2.30 p.m., the chief events of the afternoon being the 100 yards flat handicap, veterans' 40 yards flat handicap, egg-and-spoon races, tug-of-war and football matches. At 5.30 o'clock outdoor games ceased. Tea was served gratis to nearly 300 people in the company's new and commodious dining hall, after which dancing claimed attention until 8.30 p.m.

LIGHTING and POWER NOTES.

Argentina.—Rosario Public Lighting.—According to the *Review of the River Plate*, the special Committee appointed by the Rosario City Council to study the question of public lighting has resolved to request two of the firms who presented tenders—namely, Messrs. Colson, Brookhouse and Pyne and Messrs. Koerting & Co., to improve the conditions of same. From this, says our contemporary, it is easily seen that the special Committee intends to definitely exclude all other firms who tendered for this work. The two firms in question have been requested to put up a guarantee of $100,000, and new tenders were to be presented by July 26th. This action of the Rosario City Council is being most unfavourably commented upon, as it shows want of seriousness, and also indicates that everything is not as it should be. The *Review of the River Plate* thinks that instead of asking tenderers to put up guarantees of good faith the City Council should be made to do so, as its action in this question bears every indication of bad faith. Our contemporary gives the following particulars of the public electric lighting contract:—About the middle of 1911, due to the fact that in April, 1912, the contract for public lighting with the Rosario Electricity Co. would terminate the Mayor called for tenders for this service. All the tenders then received were rejected, and early in 1912 new tenders were called for, but these were also rejected. In September of the same year tenders were called for the third time on the basis of supply of current for a minimum of 1,000 arc lamps. Article 26 of the Specification also gave the right to the firm whose tender was accepted to establish a private service for light and power. After various reports had been drawn up by the municipal offices, the tenders were forwarded to the City Council. This in its turn passed them over for study by a special committee appointed from amongst their number. The majority were in favour of the tender presented by an Electric Light Co., but the minority were in favour of another proposal. Both reports were rejected by the City Council, and in view of this it appointed a second special committee to state which of the two tenders was the more favourable. A fresh report was received which the Council would not accept, thereby virtually throwing out all the tenders received; in spite of this, however, the Council did not consider the matter as terminated, and resolved to appoint a third committee with power to call upon the representatives who had, in their opinion, presented the most favourable tenders, to modify their proposals, not as regards the public lighting, which was the primary object of the tenders, but to endeavour to obtain more favourable terms as regards the price of same. Here the matter rests for the present.

The German Electricity Co., of Buenos Aires, reports the following outputs for the first six months of 1913:—Lighting, 29,483,000 units; power, 12,427,000 units; and traction, 29,860,000 units. Substantial increases, as compared with last year, are shown in the first two items.

The residents of Matheu (Buenos Aires) are proposing to form an E.L. company for the town. The Central Argentine Light and Power Co., capital £100,000, has been registered in London, to carry out a hydro-electric development on the river San Juan.

Australia.—The Brisbane South (Q.) Municipal Council has decided to float a loan for £100,000, for the purpose of carrying out various works, including the installation of an electric lighting system, at an estimated cost of £30,000. At the present time the illumination of the municipality is carried out by the South Brisbane Gas and Light Co., Ltd.

The Electric Light and Power Supply Corporation, Ltd., of Balmain, N.S.W., has ordered from the Australian Metal Co., Ltd., an A.E.G. 2,000-kw. turbo-alternator, complete with condensing plant and pipe work. The plant is to be running in March of next year.—*Mining and Engineering Review (Aus.)*.

Beauly (near Inverness).—The B. of T. has approved of the Special Drainage and Lighting Committee's scheme for the electric lighting of the village.

Bradford.—Tariffs for Shopkeepers.—A lengthy letter, explaining the position of shopkeepers as consumers of electric light, was recently sent by Mr. Roles, the city electrical engineer, to the Bradford Chamber of Trade, following on two interviews with representatives of that body.

Our readers will be familiar with many of the points raised by Mr. Roles to illustrate the disproportionate results which would accrue to the shopkeepers as a body by a reduction in the flat rates of 4d. per unit for inside lighting and 3½d. per unit for arc lighting. Figures are given to show that nearly 20 per cent. of the current supplied to shops is on the m.d. system, and that if that were left out of consideration, and the flat rates mentioned were each reduced by ½d. per unit, the department would lose in revenue £4,320 per annum, but of this amount the shopkeepers would benefit only to the extent of £1,270, and the shorter hour consumers would reap more advantage than those whom it was intended to benefit.

Mr. Roles then explains the altered position under the maximum demand tariff, and hints at a revision of the present m.d. tariff "on some such basis as 6½d. per unit for the first 365 hours' use of the m.d. per annum, and ½d. per unit after," which would, of course, be very much to the advantage of the long-hour shop consumer. The ½d. rate would also facilitate the adoption of electric heating and cooking by shopkeepers. The deputation had objected to a suggested tariff based on a standing charge of 20 per cent. of the rateable value, plus ½d. per unit, and the electricity department was considering alternatives.

In the course of the interviews the question of low charges made to large power consumers was raised, and Mr. Roles goes on to explain the influence which the large power output has in reducing the charges to lighting consumers. He points out that no great increase (comparatively speaking) in lighting units is possible, and gives data showing that in 1904 12,570,000 units were sold for all purposes, while in 1913 24,417,000 were sold, the revenue growing from £82,245 to £120,738. The lighting units, however, only increased from 2,226,000 in 1904 to 2,975,000 in 1913, and the lighting revenue from £36,700 to £40,608.

Thus during the 10 years there was an increase of 750,000 lighting units and of £4,000 in revenue from that source, while the total output increased by some 12,000,000 million units and total revenue by nearly £40,000, showing the value to the department of low-priced units supplied for power and traction purposes. Mr. Roles deals with the various reductions in price which have been made from time to time and their influence on revenue; also with the effect on net profit of the shortening loan periods of the present time—in fact, the letter contains a most instructive summary of the position of electricity supply in Bradford, as well as of other matters which perplex the average consumer.

Bromley (Kent).—A B. of T. inquiry was held at Bromley last week relative to the application of the West Kent Electric Co., Ltd., for permission to lay a series of mains in the town, the routes of which are objected to by the T.C. For the company it was stated that it had powers to supply electricity throughout a large area in the Beckenham and Bromley district; it would not be the distributors, but would supply electricity in bulk to the Bromley Co. The mains would run through Lewisham, along the Bromley Road, round Beckenham, Hayes, Orpington, and Chislehurst, and eventually back to the South Metropolitan mains. One of the objections raised was that several of the roads on the route had too many pipes and cables under them. It was added that alternative routes suggested by the T.C. were quite impracticable for the company's purpose. For the Council it was stated that both sides of Bromley High Street were quite full of pipes and cables now, and the pavements were narrow, while the Council had at the present time a proposal to lay there a concrete bed and wood pavement. Mr. Patchell, the B. of T. Inspector observed that it would be a good opportunity for the Council to

do it when the mains were being laid, and to make the company pay part of the cost. He added that the B. of T. would give its decision in the course of a few weeks

Canada.—Work has been started on the hydro-electric power station of the Cedar Rapids Co., Montreal, which, when completed, will be the largest in the Dominion. The initial rating will be 100,000 H.P., and later this is to be increased to 160,000 H.P. The site is 30 miles above Montreal, at Cedar Rapids, on the St. Lawrence River. The generating equipment includes 12 10,800-H.P. water wheels and generators, which are to operate at 56 R.P.M., under a head of 30 ft. The plant is expected to be finished in October, 1914.

Fort William, Ont., which has no gas for domestic purposes, is going to reduce the cost of electricity for cooking purposes, from the present price of 3 cents per KW.-hour to 1½ cents, when it is used for cooking. The city purchases from the power company all the electricity that is used for lighting and domestic purposes, and retails it to the consumer. At present, Fort William, and its twin sister Port Arthur, enjoy the cheapest lighting rate of any cities in Canada.

The Hydro-Electric Commission has decided to enlarge the power station at Niagara Falls, and to double its line between London and Dundas. The towers are already built, and the stringing of the double line to provide Western Ontario with Niagara power, will be commenced at once. The work to be undertaken will cost $300,000.

Cheltenham.—The T.C. has received the sanction of the L.G.B. to a loan of £2,000 for future extensions of mains.

Chesterfield.—The T.C. has decided to apply to the L.G.B. for a loan of £4,000 for high-tension transforming machinery and a transmission line, and for an additional £3,000 for prospective expenditure on mains for five years.

Continental Notes.—FRANCE.—La Société Electrique Centre-Ouest has applied for a concession for the electric lighting for 195 small towns and villages in the Deux-Sevres, Vienne, La Vendee, La Charente and adjoining departments.

NORWAY.—Electric driving, with a separate motor for each loom, is being adopted at the new cotton weaving mills of Messrs. Knud, Graah & Co., at Christiania, a contract having been placed with the A.E.G. for 160 ½-H.P. electric motors.

As regards the proposed harnessing for electrical purposes of the waters of the Aura, Mardola, and Lilledal water courses in the Romsdalen district, H.M. Consul at Christiania reports that the Norwegian Storthing has agreed to the granting of this concession. The concessionaire would appear to be connected with an international syndicate, which proposes to manufacture carbide, cyanamide, nitric acid, nitrate of ammonia, cyanide of sodium, &c.

Dartford.—WORKHOUSE LIGHTING.—The B. of G. of August 12th decided to have the male and female infirmaries at the workhouse lit by electricity under a specification drawn up by the electrical engineer to the U.D.C.

The Council has informed the R.D.C. that arrangements had been made to supply current in bulk to the West Kent Electricity Co., which is the authorised undertaker for the rural area, and pointing out that as the U.D.C. would not now supply consumers in the rural district direct, the consent of the R.D.C. was not now required. As the matter mainly concerns the parish of Crayford, the R.D.C. has referred the question to the representatives of that parish for consideration

Dudley.—The *London Gazette* contains official notice of the intended transfer of the Corporation's electric lighting powers to the Shropshire, Worcestershire and Staffordshire Electric Power Co., Kingsway, London.

Ealing.—Commencing last Sunday, the Corporation's electricity supply was to be shut off from 3 a.m. to 6 a.m. on Sundays and Wednesdays until the end of September, owing to alterations in connection with the installation of a new switchboard.

Foleshill.—PROV. ORDER.—The Midland E.L. and Power Co. has informed the C.C. that it intends applying for a prov. order for electric supply in the area of the R.D.C., comprising the parishes of Wyken, Binley, Walsgrave-on-Sowe and Bedworth.

Greenock.—YEAR'S WORKING.—At a recent meeting of the Electricity Committee, the convener in referring to the department's finances, said the estimated income for last year was £48,549 and the net balance £3,322. After the estimate was submitted, the Committee made a reduction of a half-penny per unit for lighting energy, which reduced the estimated net balance to £1,820. The actual results were that the total income amounted to £49,279, as compared with £46,150 in the previous year, and the working expenses were £27,155 as compared with £27,717, a decrease of £367, although the sale of electricity amounted to 11,421,000 units, as compared with 10,204,000 units, an increase of 1,218,000 units sold. The gross profit amounted to £21,928, compared with £18,432 in the previous year, representing fully 9 per cent. on the capital expended on the undertaking. From the gross profit £7,478 had been paid for redemption of capital, £2,762 for depreciation, leaving a net profit on the year's working of £5,204. This was the more satisfactory in view of the fact that the coal contracts during the year were placed at an average cost of nearly 2s. per ton more than in the previous year, and that a reduction was made in the price of electricity.

Hong-Kong.—The Hong-Kong Electric Co. has recently introduced the restricted-hour system of charging for power users, and made arrangements for the hire of motors of from 1 to 20 B.H.P. These innovations are said to be much appreciated by Chinese business firms.

Hull.—An arrangement has been entered into between the Corporation and the Sculcoates R.D.C. whereby the Hull authority is to supply electricity for residential lighting purposes to Sutton, just outside the boundary. The arrangement is only temporary, as the Corporation will have to obtain a provisional order, and it does not apply to street lighting.

India.—The Madras Electric Supply Co. has given notice that in certain districts its mains are fully loaded, and that the present machinery in its power house is not, until further extensions are carried out, able to cope with any more load. The company now buys current in bulk from the supply company.

Japan.—The development in the use of electric power has been accompanied by the simultaneous extension of electric lighting in Japan. From the beginning of 1900 to 1910 the number of lighting companies has risen from 49 to 122; the buildings electrically lighted have increased from 47,701 in 1901 to over 600,000 in 1910; and the number of private lamps in use has advanced from 300,000 to 1,900,000, whilst the street lighting lamps have grown from 6,400 to 59,300 in the same period of years. Many of the lighting companies are also owners of tramways, and their total net receipts have increased nine-fold in the 10 years ended with 1910. Not only so, but the ratio of net profits to expenditure has constantly improved. It formerly stood at 3 to 1, but at present almost 50 per cent. of the total profits represents net profits.—*Far Eastern News.*

Kenilworth.—The U.D.C. has appointed a Committee to consider what steps shall be taken regarding an application by the Leamington E.L. and Power Co. for a prov. order for electric light.

Kingstown.—An amusing letter was read at the Council meeting on Monday, from Mr. T. M. Healy, M.P., thanking the Council for its resolution expressing approval of his action in reference to the Bill for the electric lighting of Kingstown, which was recently before the House of Commons. The Bill, it will be remembered, was blocked by certain members of the "official" Nationalist party, and Alderman Cotton, member for South Dublin, took an active part in the proceedings. Mr. Healy wrote:—"It was not easy to do anything in Parliament when opposed by such forces as your representative engaged in the service of the Gas Co. I hope, however, you may ultimately be able to convince fair-minded members that there is no true relation between patriotism and carbonic monoxide. For myself, I cannot see how it is contrary to National principles to maintain that Kingstown need not be perpetually doomed to the yoke of Alderman Cotton's gasometer." After a lengthly and somewhat acrimonious discussion, the letter was marked "Read and noted." A letter from Mr. Horner, M.P., on the same subject, was also marked "Read and noted."

Llanfairfechan.—The U.D.C. has held a special meeting to discuss the electric lighting question. The report of the consulting engineer (Mr. W. R. Walton) was considered, and resolutions were passed that negotiations be opened with the owners of the upper and lower mills as to their water rights. It was also decided to ask the North Wales Power Co. to receive a deputation on the question of its terms for supplying electricity in bulk to the district.

Lanarkshire.—Satisfaction was expressed at a meeting of the Wishaw T.C. that for the first time the electricity department accounts showed a credit balance of fully £80. The prospects for the future are bright, as a new agreement with the Clyde Valley Co. will mean a saving to the burgh of £200 per annum.

London.—In connection with extensions at Tilbury, the Port of London Authority proposes to add 12 electric luffing cranes of the same type as those recently ordered (and referred to in these columns), for the Royal Albert Dock. To meet the additional power requirements, the power station at Tilbury Dock will be extended. The Authority has arranged with West Ham Corporation for the supply of electricity for pumping at the new dry dock at the Royal Albert Dock extension, and has decided to abolish steam in favour of electrical plant at the Cold Store at West Smithfield.

Louth.—PROV. ORDER.—Messrs. Foote & Milne, Ltd., have informed the T.C. that they intend applying to the B. of T. for a prov. order for electric lighting.

Newport (Mon.).—Certain improvements in street lighting have been agreed to by which lamps giving some 20,000 C.P. will be substituted for lamps giving 8,000 C.P., at slight additional cost. The borough engineer has been instructed to report as to whether further improvements in the lighting of the town are advisable, and, if necessary, to prepare a scheme and estimates, &c.

PROPOSED LOAN.—The L.G.B. has fixed August 27th for an inquiry into the application of the T.C. for a loan of £10,600 for electricity purposes.

Newton-in-Makerfield.—We are informed that Mr. E. M. Lacey has been asked to report to the Council on the question of electricity supply.

New Zealand.—The Devonport B.C. has approved of the plans for electric lighting in the borough. The scheme has been drawn up by Mr. D. M. Davis, and the ratepayers have signified their desire to have an electric lighting system installed.—*New Zealand Shipping and Commerce.*

Ormskirk.—Workhouse Lighting.—At a meeting on August 14th the B. of G. decided to adopt gas instead of steam power for generating electricity for the workhouse.

Portslade (Sussex).—The U.D.C. has appointed a committee to consider the advisability of providing a supply of electricity for the district. Two firms have already applied to the Council for a supply of current for power, and there are other firms in the town who need electricity for their works.

Rhyl.—In a recent report to his committee, Mr. E. H. Wright, the Council's electrical engineer, pointed out that the growth of the load rendered it advisable to consider how the next season's probable load is to be met.

Sheffield.—The Installation Department.—The L.G.B. has sanctioned the borrowing of £79,700 for extensions at Neepsend electricity generating station.

At a meeting of the City Council, an amendment to the report of the Electric Supply Committee was moved and accepted—that the report relative to the future working of the installation and motor department be not confirmed, but that such report should be referred to a Special Committee for inquiry into the working of the commercial and other departments of the electric supply undertaking, and to report to the Council. The object of the amendment was, so the mover explained, to refer the question which had caused so much conflict in the past, to an independent Committee, and to lift it from the atmosphere of controversy.

Swinton.—Mr. H. C. Busbridge, the electrical engineer, reported to the D.C. last week that the erection of the experimental electric lamps in Manchester Road was expected to be completed in a few weeks. The electrical plant at Broad Oak Park sub-station was practically complete, and provided that the delivery of materials could be expedited, consumers might expect a supply in about two weeks.

Sunderland.—At a meeting of the T.C., on the 13th inst., the Electricity Committee recommended that the charge for exterior lighting of business premises be reduced to a uniform 1½d. per unit.

Uruguay.—The directors of the State Electric Light and Power Houses have resolved not to call for tenders for the construction of new stations and expropriation of existing private stations, as it has not been possible to place the loan of $4,000,000, proposed for this purpose.

Wallasey.—The L.G.B. has sanctioned the borrowing by the Corporation of over £11,000 for mains, services, and transformers for the electricity undertaking.

Waterford.—E.L. Scheme.—In connection with the scheme for the electric lighting of the city, the Lighting Committee received a number of applications from electrical engineers. These were forwarded to Mr. Mark Ruddle, Dublin, with a request that he should select, in his opinion, the most suitable candidate. We understand that the Corporation has decided to retain Mr. E. M. Lacey to report on the proposed scheme.

Wakefield.—Annual Report.—The gross income of the electricity department for the last year was £16,095, and the net balance to carry forward was £587. The outstanding debt at the end of the year was £62,297. The output of electricity was 3,276,609 units, of which 2,375,413 were supplied to private consumers, this being a considerable increase. The number of consumers was 876, an increase of 90. The total number of motors connected was 279, representing 2,551 H.P., an increase of 40 motors and 451 H.P. The number of lamp connections was 104 876. The gross profit of the year was equal to 7·4 per cent. on the capital expenditure, and the interest and sinking fund charges were equal to 5·9 per cent. on the same expenditure. These figures compare with the previous year's 6·1 per cent. and 5·36 per cent. respectively. The engineer reports that owing to the heavier demands, the plant extensions recently decided upon would require to be pushed forward as quickly as possible.

Whitehaven.—The Lighting Committee has had under consideration a report by the electrical engineer, who has recommended that in view of improved lamps which will shortly be available, and which will give a greater light with less energy consumption, there be one combined rate of charge for domestic lighting, heating and cooking.

Whitworth.—At the District Council meeting on the 13th inst., it was reported that an application had been made for sanction to the borrowing of £10,965 for the purpose of providing an electricity supply for the district. Councillor Holt said they had allowed for future extensions that might be required. Plans of a proposed sub-station are in course of preparation, and negotiations for the purchase of the proposed station are proceeding.

TRAMWAY and RAILWAY NOTES.

Argentina.—The Mayor of Buenos Ayres recently granted permission to the Compania Tranvias Electricos del Sur to run over the Anglo-Argentine Co.'s lines to the centre of the city. The Anglo company is now appealing against this, pointing out its position under the municipal concession; the Compania del Sur operates under a national concession, which does not revert to the municipality as is the case with the Anglo company's concession.

Ashton.—It is stated that should the demands of the tramway men for an increase of ½d. per hour be granted, it will mean an additional expenditure of £1,200 per annum to the Stalybridge Joint Board, and of £300 a year to the Ashton Corporation.

Belfast.—At a meeting of the Tramways and Electrical Committee the general manager reported that in the past seven months the Glengormely branch—about the purchase of which such a terrible uproar was made for party purposes—showed a net working profit of £1,017, or the equivalent of £1,745 per annum. This was effected with a limited car service owing to limited power supply. A letter was read from the L.G.B. to the effect that Mr. P. C. Cowan, the Board's engineering inspector, would hold an inquiry about September 7th next into the Corporation's application for a loan of £35,000 for electrical purposes.

Canada.—The Canadian Pacific Railway intends to electrify the Rossland-Castlegar section crossing the Rocky Mountains, on the 2,400-volt direct-current system, and, if the results justify it, may extend the system to other branches.

Continental Notes.—Austria.—A preliminary concession has lately been granted in connection with a projected electric local railway between Wels and Klienmunchen, Upper Austria.

Russia.—The Government has granted a concession for the construction and working of an electric tramway to connect the town of Riga with the seaside resort of Majorenhof.

Italy.—The steam tramway between Pisa and Ponterda is to be converted into an electric line.

The Società Trazione ed Imprese Elettriche, of Milan, is about to commence the work of electrifying the railway between Milan and Gallarate. The same company is preparing the plans for a projected electric tramway between Portofino and Rapallo.

Turkey.—According to the *Morning Post*, several sections of the new electric tramway in Constantinople were opened to the public on August 16th.

Dublin.—At a meeting of the Corporation, this week, a resolution was passed instructing the law agent and town clerk to report to the Corporation on the steps necessary in order to obtain possession of the tramways in the city, which are owned by the Dublin United Tramways Co.

Dundee.—The Tramways Committee of the Town Council has authorised the manager, Mr. Peter Fisher, to obtain tenders for four additional cars. It was also agreed to equip all the cars on the system with wire mats, at a cost of £3 18s. per car.

Darlington.—The T.C. has applied to the B. of T. for an extension of time of three years, from October 24th next, for the completion of the electric tramway extension to Haughton.

Dunfermline.—After protracted negotiations with the T.C. the Dunfermline District Tramway Co. has decided to extend its system through Dunfermline to Milesmark, the western boundary of the burgh. When the company obtained its powers, it was a condition that it paid the Corporation £100 per mile in respect of the upkeep of the tramway track. As an incentive to the company the Council has agreed to reduce the payment to £60 for a period of five years.

Greenock.—Proposed Tramway Purchase.—Notice of motion to municipalise the local tramway system has been made by Councillor Mitchell. The motion is in the following terms:—"That the Corporation instruct the town clerk to give due and proper notice to the Greenock and Port-Glasgow Tramway Co. that the Corporation has decided to exercise the option they were entitled to in terms of Clause 17 of the lease entered into by the Corporation of Greenock and the tramway company to terminate said lease at the first break therein, viz., May 15th, 1914."

Ramsbottom.—Railless Trolley System Started.—After inspection on August 14th by Major Druitt and Mr. Trotter, of the B. of T., the new railless trolley-car system at Ramsbottom, near Bury, was opened for public use on the same day. The system, which is the first of its kind in Lancashire, has attracted much notice in the County Palatine. The single-decker vehicles, of which two were delivered last week, have seating accommodation for 28 persons each, and the seats are arranged transversely. The cars are equipped with a couple of 20-H.P. motors. Messrs. Siemens have supplied the electrical equipment, Messrs. Brown (Huddersfield) have made the chassis, and Messrs. Milnes, Voss & Co. (Birkenhead) have built the bodies—the whole being under the supervision of the Railless Electric Traction Co.

Messrs. Clough, Smith & Co. were the contractors for the overhead equipment. The power is supplied at a pressure of 10,000 volts by the Lancashire Electric Power Co., and is received at a

sub-station adjoining the tramshed, where it is transformed to a pressure of 500 volts. The route extends from Holcombe Brook to Edenfield, with a branch down Bridge Street to the railway station. The fares are 1d. for any four quarter-mile stages, and ½d. for each two stages beyond the mile. Delivery of other two cars was expected this week.

Reading.—The T.C. is to promote a Bill for the next session, for carrying out an extension of the tramways, and the running of railless cars and motor-omnibuses.

Ryton.—At the last meeting of the Council, the chairman suggested that the Gateshead and District Tramways Co. be asked to take into consideration the question of a motor-'bus service for the district, including Greenside and Crawcrook, when it considers the proposed service for Whickham and Blaydon districts.

South Africa.—Table Mountain Railway.—Two alternative schemes have been presented to the Cape Town City Council for a railway to the summit of Table Mountain. Scheme No. 2 has been provisionally approved, at an estimated cost of £75,000, and it remains to obtain the ratepayers' sanction. The approved scheme comprises two funicular railways, to be worked by power furnished by the Corporation electricity department; construction is expected to take 2½ years.

Stirling.—An important proposal has been made the T.C. by Mr. G. Balfour, of Messrs. Balfour, Beatty & Co., with respect to the electrification of the Stirling and Bridge of Allan tramways, which are at present conducted by horse haulage. Mr. Balfour, in written propositions, stated that he was prepared to acquire the existing tramways undertaking, providing the company was agreeable to make a reasonable arrangement. If such an arrangement was made, he stated that he would apply to Parliament for powers to enable him to reconstruct and electrify the existing lines. He pointed out, however, that he could only carry out that proposal on condition that he acquired Stirling burgh electricity station, and he stated that in such case provision would be made for the reduction of the charges for domestic and street lighting. The T.C. decided to consider the matter.

Tasmania.—The Hobart electric tramway system was taken over by the Corporation from the company on July 1st. The purchase price was £210,000.

U.S.A.—According to the *Indian Textile Journal*, a three-wheeled electric carriage has been invented by Charles B. Chrysler, of Chicago, which, in places where current is available, seems destined to replace the juiricksha. The framing is of steel tube. The body is of basket work carried on strong bicyle wheels, and it is built to carry two stout persons at a speed of 5 miles an hour. The weight with Edison battery and Westinghouse motor is 300 lb. The front wheel is steered with a tiller. There is a special sunshade overhead, and the movement and brake are controlled by foot levers.

Whitworth.—It was reported at the U.D.C., on the 13th inst., that as a result of the Tottenham appeal in regard to the rating of the tramways, the Rochdale Corporation had paid the full rate to the Whitworth Council, and that that meant a gain to the latter of about £150, compared with last year's rates.

TELEGRAPH and TELEPHONE NOTES.

The Vancouver Submarine Telephone Cable.—A telephone cable which has been laid in the gulf of Georgia, connecting Vancouver, on the mainland, and Vancouver Island, B.C., is said to be the longest submarine telephone cable of the kind in the world. A great part of it is laid at a depth of 200 fathoms, being at one point 1,356 ft. deep.

The cable length, according to the Canadian *Electrical News*, is 28 nauts, and it is continuously loaded, having a diameter of nearly 2 in. and weighing 8 tons per naut. The electrical constants of each core per naut are—resistance 4 ohms; capacity ·35 mfd.; dielectric resistance 250 meghoms after 1 min. electrification at 75° F. The attenuation constant is about ·019 per naut of cable at 800 cycles. The cable, which is worked with a phantom circuit, and can be used for three simultaneous conversations, was supplied and laid by Messrs. Henley's Telegraph Works Co.

Canadian Farm Telephones.—According to the *Financier*, a report dealing with the telephone service of Ontario points out that, whereas five years ago there were less than two thousand telephones in farmhouses in Ontario, to-day there are, approximately, 460 systems owned by provincially incorporated companies, co-operative associations, partnerships and individuals, operating nearly 50,000 telephones, and representing a capital investment estimated at $4,000,000; 90 per cent. of these systems, which do not include those of the Bell Telephone Co., were organised by farmers, who, of their own initiative, have established this service and furnished most of the necessary capital.

German Wireless Telephone Experiments.—According to the *Standard*, experiments conducted at Nauen by the Ges. fur Drahtlos Telegraphie, with an instrument invented by Count Arco, have at last resulted in conversations being maintained between Nauen and Cologne, Metz, Strasburg, Wilhelmshaven and Vienna.

Italian Telephone Project.—An important scheme for linking up 300 small towns and villages by means of the telephone in the Province of Glessandria is at present under consideration.

Marconi Patents.—At the request of a member of the House of Commons, a return is to be prepared and issued of patents in respect of which royalties will be payable under the contract with the Marconi Wireless Telegraph Co., the dates when such patents were granted, the areas in respect of which they run, and the dates when they expire in the ordinary course.—*Times.*

Russian Wireless.—A dispatch from St. Petersburg to the *Financial News*, says that the Russian Wireless Co., in which German capitalists are greatly interested, is preparing an issue of new shares to a nominal total of 600,000 roubles, at the price of 101·5 per cent. The capital of the company will thus be increased to 2,400,000 roubles.

Siberia-Alaska.—According to the *Electrical Review and Western Electrician*, direct wireless communication has been established between the U.S. Army station at Nome, Alaska, and the Russian station at Anadyr, Siberia, 500 miles distant. The U.S. officials have been trying to establish communication with the Russian stations for the past six months, but it appears doubtful whether the Nome station will be available for commercial service.

Telephone Payments.—The Postmaster-General has under consideration the question of the payment of telephone subscriptions quarterly, instead of yearly.

Trans-Continental Telephone.—According to American reports, steps are being taken to obtain three complete telephone circuits between Denver and San Francisco; Denver and New York City have had telephone communication for some time, so that in the near future the service will extend across the Continent.

Venezuela.—Telephonic communication has just been established between the towns of Amparo and San Carlos, in the district of Ricaurte.

Post Office Employés.—The House of Commons' Select Committee has issued its report on wages and conditions of employment in the Post Office. A general increase of wages is suggested for all grades within six months. It is recommended that male telegraphists and counter clerks in London shall rise to a maximum of 65s. per week, beginning at 18s. at 18 years of age. For the provinces telegraphists in the first class are to have 16s. at 18 years of age, rising to 58s. maximum. The figures for females are to be:—London, 16s. (under 18) to 40s. maximum; provinces, 13s. (under 18) to 36s. in the first class. The Committee find that there has been an increase in the cost of retail prices of standard commodities of 13·7 per cent. since 1905. Holidays are to remain unaltered. It is stated that the telephone staff have no ground of complaint with regard to the terms of their transfer from the National Co.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Brisbane.—September 24th. Ironwork, cast-iron pipes, iron poles, galvanised iron wire, for the P.M.G. See "Official Notices" August 15th.

Perth.—October 8th. Bolts for the P.M.G. See "Official Notices" to-day.

Melbourne.—October 7th. Electrically-driven machinery for operating pneumatic tube services. See "Official Notices" to-day.

Melbourne.—November 4th. Automatic switches for exchanges in metropolitan network. See "Official Notices" to-day.

Melbourne.—September 9th. City Council; electricity recording meters and maximum demand indicators. See "Official Notices" to-day.

Austria.—August 25th. The Austrian State Railway authorities at Prague are inviting tenders for an electrically-operated goods lift at Weinberg.

Basingstoke.—September 17th. Corporation. (Section *a*) Diesel generators, balancer set and booster set; (*b*) storage batteries; (*c*) switchboard and instruments; (*d*) cables and cable laying; (*e*) overhead travelling crane. See "Official Notices" to-day.

Belgium.—The municipal authorities of the little town of Ouffet (province of Liége) have just invited tenders for the supply of electrical energy for public and private lighting and power purposes.

September 3rd.—The municipal authorities of Liége are inviting tenders for a steam turbine and alternator of 4,000 kw. capacity. Specifications can be obtained for 1 fr. from Le Chef de Bureau des Services Industriels, Annexe de l'Hotel de Ville, Liége.

Birmingham.—August 27th. 205,000 tons of coal for the Corporation generating stations for one year. Mr. R. A. Chattock, city electrical engineer, 14, Dale End.

(*Continued on page* 303.)

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THE GLASGOW PICTURE HOUSE.

(PROVINCIAL CINEMATOGRAPH THEATRES, LTD.)

Some 18 months ago we published an illustrated description of the Leeds "Picture House," but progress in the cinematograph industry has been so rapid, that we cannot but think that a few further details of the design and equipment, illustrating the most modern practice in this branch of industry, will prove of interest to our readers.

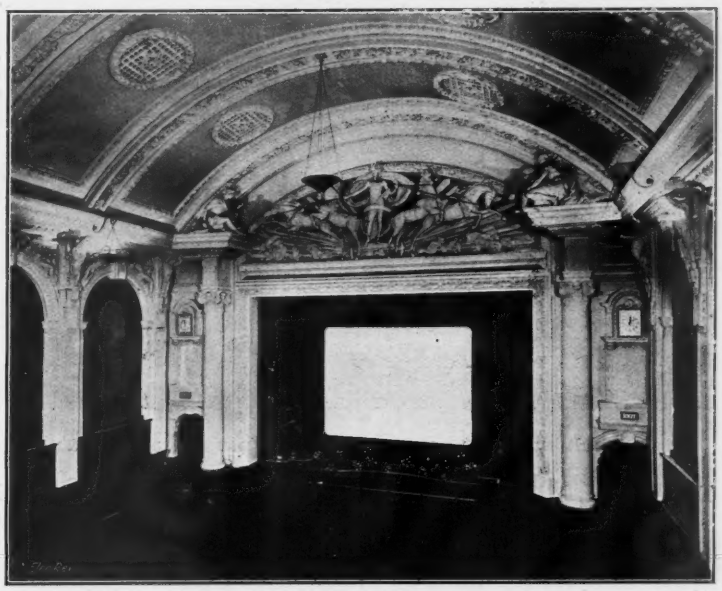
On behalf of the directors of the Provincial Cinematograph Theatres, Ltd., Sir John Ure Primrose opened the "Picture House," 140, Sauchiehall Street, Glasgow, on December 19th, 1911, but so popular did the cinematograph form of entertainment become, that it was soon found necessary to double the accommodation.

In August last the old theatre was closed for extensive alterations, and an average number of 250 men were continuously employed — night, day and Sunday—without intermission for four months in its reconstruction, which has cost upwards of £30,000; in the result the Provincial Cinematograph Theatres, Ltd., has added to its list a building which it justly claims to be the premier cinematograph theatre of the world.

The site, which is 220 ft. deep, has a frontage of 60 ft. to Sauchiehall Street and has been divided into three parts.

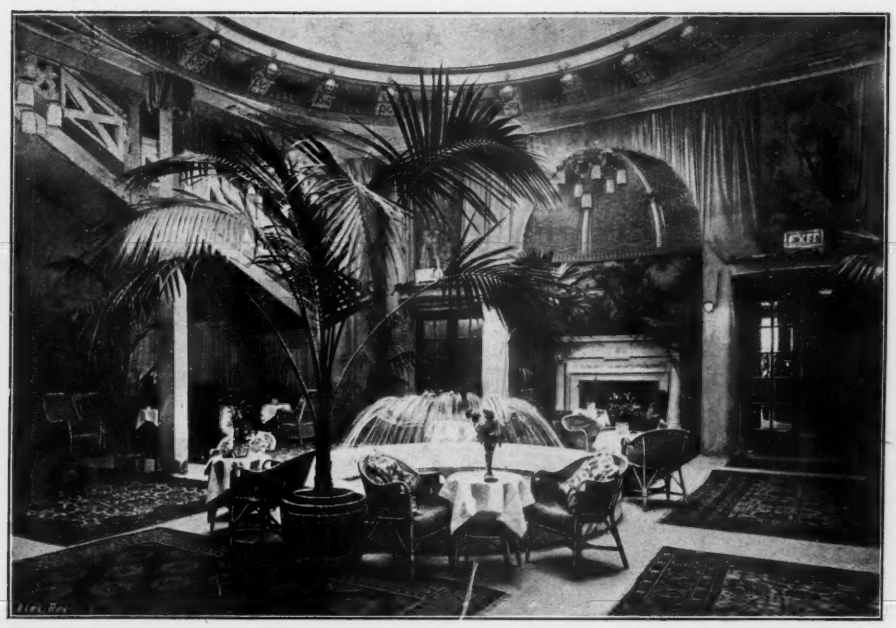
The Entrance Hall and Vestibule, from which two broad staircases lead to the balcony; this is panelled in dark oak, and includes the ticket office, two cloak rooms and a telephone exchange with public call office.

The Palm Court, a magnificent tea lounge and waiting hall, 50 ft. sq.; this is surmounted by a handsome cathedral glass dome 20 ft. in diameter, and has a fairy fountain which plays continuously into a mosaic basin 9 ft. in diameter, the water rising to a height of 8 or 10 ft. A prominent feature of this lounge is the panelling, staircases and pavement, which have been carried out in grey, white and rose tinted marble.



Projection Hall, Glasgow Picture House, Showing the Lighting.

The Projection Hall, which is one of the largest in the country, has a floor area of 120 ft. × 60 ft. and is surmounted by a barrel vaulted ceiling 50 ft. above the theatre floor. The decoration consists of fumed oak panelling and fibrous plaster work, six of the bays being hung with real tapestry figure subjects. A striking feature of the proscenium is a handsomely modelled group of statuary representing Phœbus, the Sun God.



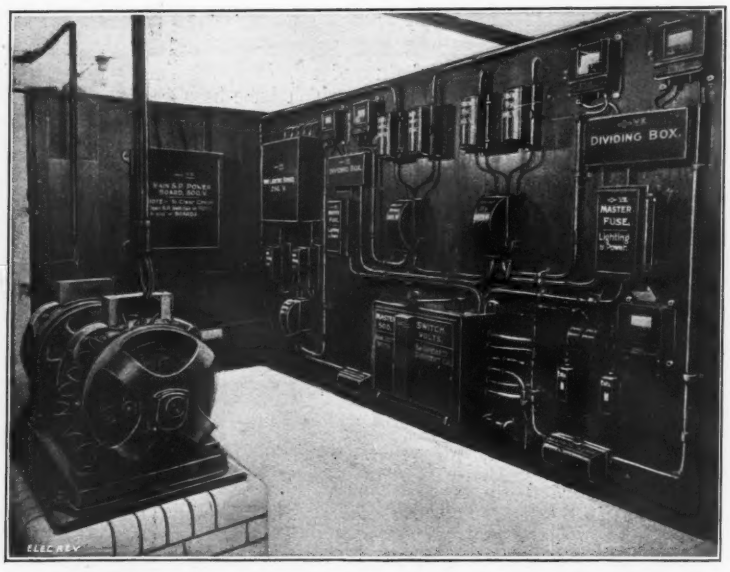
The Palm Court, Glasgow Picture House.

Under the ground floor of the main hall, with direct access from the Palm Court, is the Jacobean Café, furnished in comfortable masculine style, where the business man may enjoy a quiet smoke or read, with telephonic and other facilities at hand.

For the ladies, the Wedgewood Café has been provided on the first floor adjacent to the balcony of the Palm Court, and during the past two years, this room has firmly established itself as one of the favourite meeting places of the city.

As our readers will fully appreciate, the technical equipment of such a building is a serious financial item, requiring

not a little initiative and forethought in addition to technical skill in its design as well as careful supervision during erection, for the success or failure of the whole undertaking depends to a very large extent on efficient lighting, heating, ventilation and projection.



Meter Room, containing Main Switches, Motor-generator, &c.

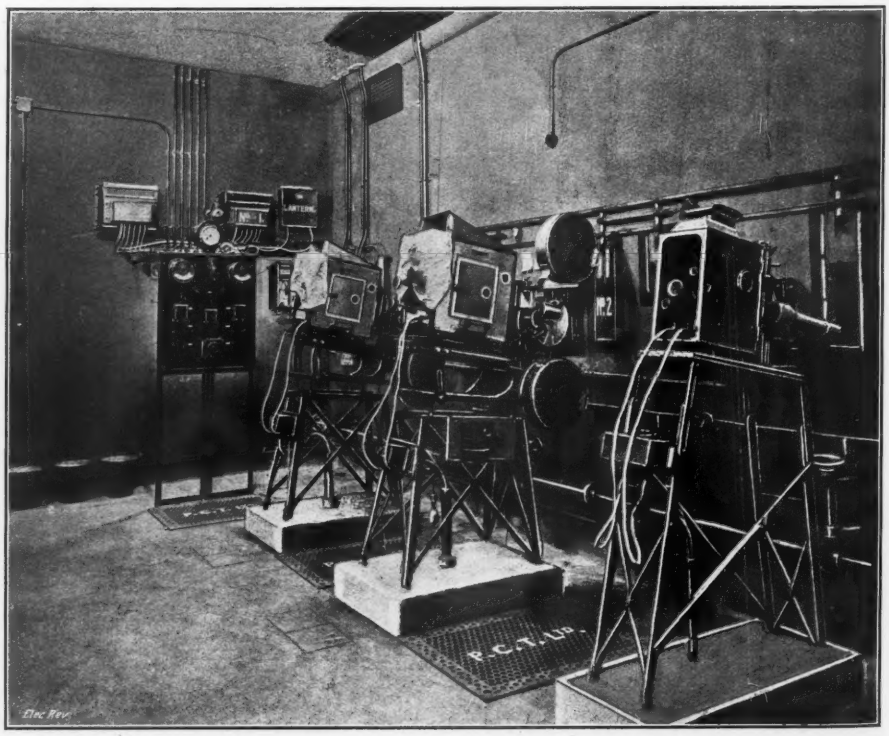
Turning to the electrical side, two four-wire 0·25 sq. in. lead-covered and armoured services are tapped off the Sauchiehall and Renfrew Street mains of the Glasgow Corporation Electricity Supply and connected to a 250-amp., 500-volt, four-pole throw-over ironclad switch, supplied by Messrs. Ward & Goldstone, and fixed in a special meter room situated in the centre of the building. From this switch, 37/16 V.I.R. connections are taken to two ironclad main D.P. five-way lighting distribution boards and two six-way S.P. power boards, which were supplied by the Wandsworth Electrical Co. to the Provincial Cinematograph Theatres, Ltd.'s own standard designs.

The incandescent lighting, which is fed from seven local distributing boards placed at convenient points throughout the building, has been carried out on the "indirect" system, and a striking feature of the Projection Hall is the three 42-in. ceiling, and six 30-in. cornice bowls, which carry 1,000 and 600-watt Osram lamps respectively. These fittings are of hammered brass, but those used in the balcony of the Palm Court are of ½ in. alabaster turned from the solid, some exceedingly artistic effects being obtained with the varying coloured veins. On the ground floor of the Palm Court it was practically impossible to use reflected lighting owing to the various levels from which the fittings are seen, and, therefore, a lantern treatment harmonising with the Louis XVI decoration, was adopted. In order that the beauty of the cathedral glass dome shall not be lost at nightfall, six 1,000-watt Osram lamps are fixed on the upper floor, and a beautifully diffused light—natural by day and artificial by night—is, therefore, transmitted through the stained glass.

For the Oak Lounge, a quaint old lantern design of electric fitting was adopted for the pilasters, and this, in conjunction with two-light candle brackets of the Dutch period, produces a most pleasing effect.

The ventilating plant installed is a very elaborate and costly one, and the company claim that it is by far the largest of its kind in the British Isles. The temperature of each apartment can be kept constant, entirely independent of the fact that the temperature of the outside air may vary from 30° F. to 80° F., or the number of persons present from 1 to 1,200. As to the chemical constitution of the atmosphere, the CO_2 is not allowed to exceed 6 parts in 10,000 parts of air, while ozone is infused into the air by the most modern of plants, supplied by Messrs. Ozonair, Ltd. Some idea of the capacity and size of the plant may be obtained from the fans, which were supplied by Messrs. Davidson & Co., and are driven by electric motors of a combined output of 30 B.H.P., the machines being built to the company's standard specification by the Electric Construction Co.

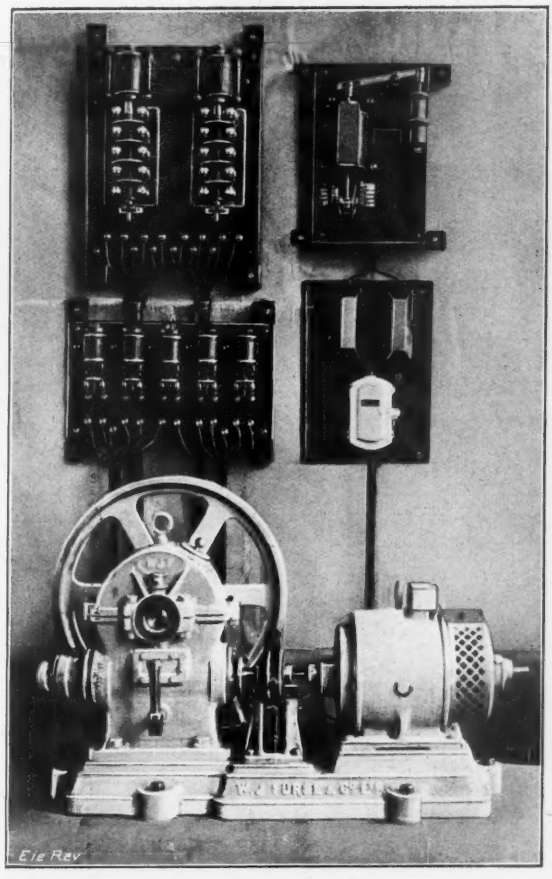
As may be expected, the heating and hot water supply plant has also been carried out on the same elaborate scale, and four boilers of the sectional independent type, made by the National Radiator Co. and the Strebel Co. respectively, have been installed in the basement. The heating installation is on the small bore, forced-circulation system, the pump being direct-coupled to a totally enclosed 1-B.H.P.



The Lantern Room, Glasgow Picture House, showing the Projectors, Switchboard, &c.

E.C.C. motor and connected in the main return header for the purpose of forcing the cooled water back to the boilers.

At one end of the boiler room a 1,000-gallon tank has been sunk into the floor, and this is connected by a 4-in. pipe to the fountain basin previously mentioned in the Palm Court. Near



Electric Lift and Push-Button Control Gear.

by a 14-B.H.P. totally-enclosed E.C.C. motor has been direct-coupled to a Rees-Roturbo pump, capable of delivering 15,000 gallons per hour into an overhead tank 90 ft. above, and from this point the water falls by gravity to the fountain, passing through the air filter screens on its way down.

Since the average attendance at the Picture House is more than a million people a year, it can readily be understood that elaborate provision has to be made for the removal of the dust and dirt carried in from the streets, and for this purpose an electrically-driven 8-B.H.P. vacuum pump, connected through a 1½-in. pipe line to all parts of the building, has been installed, which is capable of maintaining an 8-in. vacuum on the range when dealing with 10,000 cb. ft. of air per hour from five 12-in. renovators, some 2 cwt. of dust being removed from the carpets and seats each week by this process.

The lantern room, which is probably the most important point in the whole buildings, is a well-ventilated apartment, measuring 21 ft. × 16 ft × 12 ft. high. Two moving picture projectors and one slide projector are installed, the electrical equipment being supplied by Messrs. Morris and Lister, to the company's standard designs and specification. For the electric supply to the projection arcs, which require

Picture Indicator.

100 amperes each, a four-bearing semi-enclosed direct-coupled motor-generator, by the Submersible and J. L. Motors, Ltd., is fixed in the meter room. As a stand-by to this set, in the event of breakdown, a five-way paralleling resistance of 16 amperes capacity per way connected direct on to the outers is fixed above the lantern room, but needless to say, this is only used in emergency as 80 amperes at 500 volts is a rather expensive item when taken for 10 hours per day.

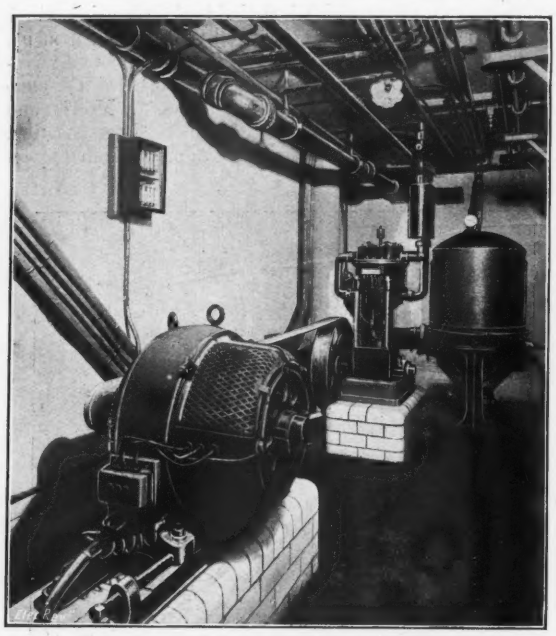
In order to ensure quick service of refreshments in the cafés, the kitchens are connected to the still rooms of the various cafés by an electric lift, provided with push-button control and supplied by Messrs. W. J. Furse & Co.

Correct time throughout the building is ensured, as all clocks are fitted with electric impulse movements, controlled by one master clock fixed in the Palm Court, which, together with the intercommunication telephone system, was supplied by Messrs. Gent & Co.; picture indicators are fixed in the various cafés

The Oak Lounge, Glasgow Picture House.

and lounges, in order to keep patrons *au fait* with the progress of the programme.

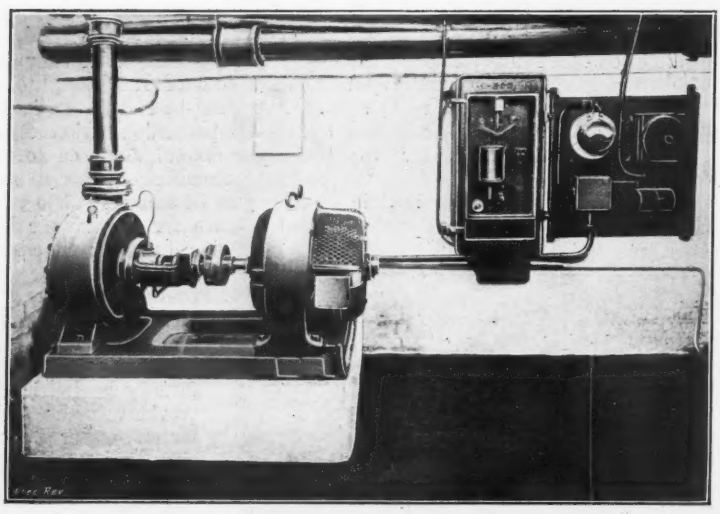
In connection with the electricity supply, it is interesting to note that the maximum demand is approximately 135 KW., made up as follows :—60 KW. motor load; 40 KW. stand-by resistance ; 35 KW. incandescent lighting.



Vacuum Cleaning Plant, Glasgow Picture House

Taking an average load factor of 35 per cent.—the entertainment is continuous from 11 a.m. to 10.30 p.m.—and neglecting the stand-by resistance, the approximate consumption will be 250,000 units per annum.

Messrs. G. N. Haden, of Glasgow, carried out the low-pressure heating and the domestic hot water supply; the fountains were supplied by Messrs. Laing, Wharton, Ltd.; the electrical fittings by Messrs. D. Shanks & Co.; the cable by Messrs. Gillespie & Beales and the General Electric Co.; and the solid drawn conduit by Messrs. Simplex Conduits, Ltd.



Pumping Plant for Fountain and Air Screens, Glasgow Picture House

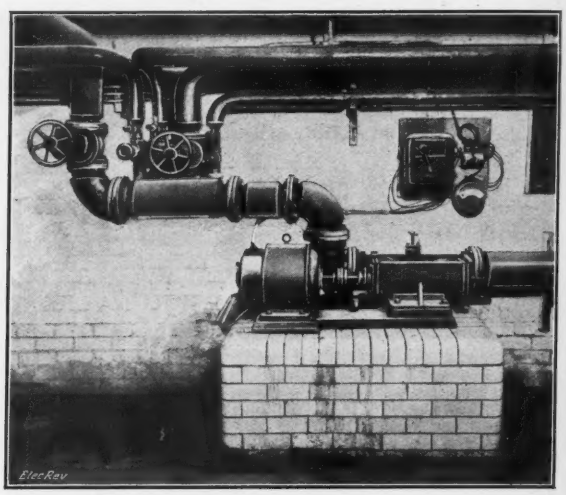
Sheffield Tramways.—A motor-'bus service is to be commenced in a few weeks for the convenience of those residing in the Upperthorpe district.

HIRE-PURCHASE AND INCOME-TAX.

[COMMUNICATED.]

A case of considerable importance to users of wagons and similar plant in particular, and to traders in general, relating to hire-purchase transactions has been decided recently in the Scottish courts.

It would appear that the Darngavil Coal Co., Ltd., had on various occasions entered into agreements with the Scottish Wagon Co., Ltd., by which on payment of specific periodical instalments extending over stated intervals they were entitled to the use of certain railway wagons, and on the termination of these agreements, and the payment of the instalments, they were also entitled to the absolute ownership of the wagons upon the payment of certain nominal sums.



Electrical Circulating Pump for Heating Installation, Glasgow Picture House.

For a long time the Inland Revenue have, perhaps not consistently, declared that no part of these payments or instalments is either a payment of interest, or a payment of simple hire, they, with the nominal sums to be paid or paid for acquiring the ownership of the property, being partial payments on account of capital, and that therefore they must not be allowed as deductions in the process of computing profits for income-tax purposes.

The attitude and determination of the Inland Revenue may be gathered from the following general instructions issued to surveyors of taxes in 1909.

No part of the quarterly or other instalments (called rent) is a payment of interest or a payment of simple hire, and it should not be treated as such, or allowed as a deduction (even if any part of the instalment were interest it would be annual interest, and consequently not an allowable deduction). The whole of the instalments as well as the final nominal payments are to be regarded as payments of a capital sum for the purchase of wagons, and no part thereof allowed as a deduction, except in a few cases where the sellers undertake to keep the wagons in repair free of expense to the traders. In these cases an annual allowance not exceeding £2 a wagon may be made for repairs during the continuance of the payment of instalments, but no longer. Allowances may be made for the actual sums paid and borne by the trader for the repairs and maintenance of the wagons, and also for depreciation of the wagons at the rate of 3 per cent. per annum on the cost to the trader, exclusive of sums

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included therein for repairs as written down yearly by such deductions. Interest paid under such agreements on overdue instalments, being short interest and accounted for by the sellers, may also be allowed as a deduction.

It must be seen that the whole amount paid for the purchase of wagons is disallowed, and that all credits for receipts from letting the wagons on hire, as well as all debits for the use of the wagons by the trader himself, are properly adjusted in the income-tax computation. Cases in which wagons are financed or surrendered to the wagon company for a money payment before being fully paid for, and immediately acquired again on fresh hire-purchase agreements for a new term of years, should be noted, and whatever adjustments may be necessary in consequence of the way in which the trader has dealt with the transactions in his books, should be made.

In some cases, the terms of the agreements incorporate a hiring expense, in addition to the usual hire-purchase instalments, and others do not do so. In the present instance, the agreement was one of hire with an option to purchase at a stated period, and the Lord President in his judgment, in which Lord Johnston and Lord Mackenzie concurred, held that the cost of hire was an expense to be deducted in the ordinary course when ascertaining the income-tax liability; but as a large proportion of each instalment was really in respect of the future purchase of the wagons, the case must be remitted to the Commissioners to decide, if the parties concerned could not do so, how much of the payments consisted of payment for hire, and how much consisted of payment towards the purchase of the wagons (since the Court had not the information before it to enable it to so analyse the instalments), with an instruction that the portion of the charge represented by hire must be allowed as a deduction in the usual way.

It may be observed in connection with these problems, that although the word "hire" appears usually in this description of agreement, it is quite possible for the terms to be such that they do not really contain any charge for hire, and in such circumstances they amount in effect merely to long-term credit purchases with the usual hiring condition. Hire and purchase terms are two quite different matters. The use of the word hire may be only a kind of legal protection.

CONTRACTS OPEN.

(*Continued from page* 298.)

Bournemouth.—August 27th. Reconstruction of 3 miles (single track) of permanent way for the Corporation Tramways Department. Mr. I. Bulfin, tramway manager. Deposit for specifications, £2.

Bradford.—August 30th. Machinery and timber, for the Corporation Tramways Department. See "Official Notices" August 8th

Bury.—August 25th. One 2,000/3,000-KW. turbo-alternator, with exciter and surface condenser, for the Corporation. See "Official Notices" August 1st.

Cardiff.—September 12th. Corporation. (1) One 2,000-KW. turbo-alternator, with surface condensing plant and auxiliaries; (2) one 700-KW. rotary converter; (3) boiler house plant. (*a*) Water-tube boilers, super-heaters, stokers, &c.; (*b*) turbine-driven feed pump and heater; (*c*) fuel economiser. See "Official Notices" to-day.

Clonakilty (Co. Cork).—August 26th. The Urban Council is prepared to give £100, or a lesser sum, for the lighting of Clonakilty by 50 electric lamps of 50 C.P. Power of lamps to be increased or diminished as Council may direct. Total power of lamps to be 2,500 C.P. Separate estimates to be given for underground and overhead systems. J. Dunovan, Town Clerk.

Doncaster.—August 26th. 20-ton hand crane for the electricity works. Mr. E. S. Rayner, borough electrical engineer, Grey Friars Road.

Dublin.—August 26th. Feed pump, cast-iron tanks, pipe-work, valves, steam separators, boiler house shutters, coal grab and steel work, for the Corporation. See "Official Notices" August 1st.

August 26th.—Supply of A.C. meters, single-phase and three-phase, for two years, for the Corporation. See "Official Notices" August 15th.

Dundee.—Corporation electricity department. Supply of cables. Mr. H. Richardson, general manager.

Edinburgh.—September 8th. Electric light and power installation at the new Town Hall, High Street, Portobello. Particulars from Mr. Newington, electrical engineer, Dewar Place.

September 22nd.—Corporation. Two mixed-pressure steam turbines and direct-current generating plants, each of 1,500 KW. capacity. See "Official Notices" to-day.

Egypt.—October 31st. Egyptian Ministry of the Interior. Machinery and plant required for the installation of electric light in the town of Damanhour. See our last issue for particulars.

Germany.—September 22nd. The Hafenbauamt at Bremen is inviting tenders for the supply of 22 electrically operated cranes of 2½ tons capacity each.

Lancashire.—September 9th. Tell-tale clocks, telephones, electric clocks and fire alarms, for the Visitors for Whalley Asylum. See "Official Notices" to-day.

London.—L.C.C.—August 25th. Electrical installation, 320 lighting points, for Middle Row School, Kensal Road, N.W. See "Official Notices" August 8th.

September 1st.—Electrical installation (100 lighting points), for the Royal Hill Central Elementary School, Greenwich, S.E. See "Official Notices" August 15th.

September 23rd.—Main high-tension switchgear, including the reconstruction of existing main high-tension switchgear, at Greenwich generating station. See "Official Notices" to-day.

Morocco.—October 13th. Moroccan Adjudications Commission, on behalf of the Shereefian Posts and Telegraphs Administration. (1) 20,000 kg. of silicon-bronze wire for urban telephone lines; (2) 177,600 kg. of silicon-bronze or phosphor-bronze wire; (3) 6,000 wooden telegraph posts; and (4) 100,000 insulators on galvanised iron brackets. Tenders to "Mons. le Président de la Commission Générale des Adjudications et des Marchés," Dar-en-Niaba, Tangier. Particulars as to deposits, forms of tender, &c., at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

New Zealand.—November 10th. Dunedin City Council invites tenders for (1) supply meters, (2) maximum demand indicators, (3) insulated cable and bare wire, for a period of two years. Specifications from the Electrical Engineer, Dunedin.—*New Zealand Shipping and Commerce.*

The same contemporary states that the time for sending in tenders for a 13-panel E.H.T. switchboard for the Christchurch City Council (City Electrical Engineer's Office) has been extended to September 6th.

Ormskirk.—Tenders are about to be obtained for plant required by the Board of Guardians in connection with the generating of electricity by gas in place of steam power, which has been used in the past.

Plymouth.—August 27th. Steam turbo-alternator, condenser, &c., for the Corporation. See "Official Notices" July 25th.

Rochdale.—August 27th. The Electricity Department invites tenders for steam coal, cartage of coal and removal of ashes, supply and erection of wet-air filter, and circulating water screens. Specifications, &c., from Mr. C. C. Atchison, engineer and manager, Dane Street, Rochdale, £1 1s.

Shanghai.—August 26th. Two 5,000-KW. steam turbo-alternators, complete with surface-condensing plant; four water-tube boilers, with integral superheaters, mechanical stokers, economisers, &c., for the Municipal Council. See "Official Notices" July 25th.

Skewen.—September 1st. Electric lighting installation at the Free Library, for Coldfranc Parish Council: The Librarian.

Spain.—August 30th. The municipal authorities of Llerena (province of Badajoz) are inviting tenders for the concession for the electric lighting of the town during a period of 10 years.

Wakefield.—September 1st. Water-tube boiler, superheater, stoker, steam turbo-alternator, condensing plant, H. and L.T. switchgear for the Corporation. See "Official Notices" August 1st.

Walsall.—August 25th. Automatic electric plant, wiring, lamps, &c., for Great Barr Hall and other buildings in Great Barr Park. Form of tender from Mr. A. H. Ward, Clerk to the Walsall and West Bromwich Unions Joint Committee, 22, Lombard Street, West Bromwich. Plans and specifications from Messrs Edwards & Shaw, consulting engineers, 105, Colmore Row, Birmingham (deposit £2 2s.).

West Ham.—September 4th. Electrical fittings for six or 12 months, for the B. of G. Mr. Thomas Smith, Clerk, Union Road, Leytonstone, N.E.

Wimbledon.—September 1st. One 1,500-KW. turbo-alternator, condensing plant, auxiliaries, and 20-ton crane, for the Corporation. See "Official Notices" August 8th.

CLOSED.

Australia.—The *Mining and Engineering Review* states hat the Gawler (S.A.) municipality has accepted the following tenders :—

Three 15-kw. transformers and 2,000-volt lightning arresters.—Australian Metal Co., £56.
Time-switch consumers' meters, insulators and street brackets.—Wm. McLean & Co., £142.
Aluminium cable.—Todd & Samuel (B.I. and Helsby Cables, Ltd.), £142.
Erection of plant.—Wm. McLean & Co., £282.

Sydney.—The *Australasian Record* announces the placing of the following contracts :—

Electric passenger lift at Seventh Shop, George Street.—Standard Waygood, Ltd. (acc.), Sydney, £630.
Carbons.—Siemens Bros., £3,382.
Australian Metal Co., £3 872.
W. G. Watson & Co., schedule.
Union Electric Co., schedule.
Crompton & Co., schedule.
Electric goods lift (No. 9) at new Parcels Post Office, Central Railway Station.—Australian Metal Co., Ltd., £635.

According to *Tenders*, the India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd., Sydney, has obtained the contract for the electric lighting plant for the town of Goulburn (N.S.W.).

Banbury.—The T.C. has accepted the tender of Mr. W. Upton (£70) for installing electric light at the Town Hall.

Belgium.—Four concerns, all German, submitted tenders last week to the Belgian Post and Telegraph Authorities in Brussels for the supply and laying of a quantity of telephone cable in the town of Boorn, the lowest offer being that of the Siemens and Halske Co.

Bolivia.—The Bolivian Government has accepted the tender of the Electric Light and Power Co. for carrying out various railway works.—*Review of the River Plate.*

Bolton.—The Electricity Committee has accepted the tender of Messrs. Wm. Pollitt & Co. for laying cable conduits in connection with the new generating station at Back-o'-th'-Bank.

Bury St. Edmunds.—The B.C. Electricity Committee has accepted the following tenders :—

Underfeed Stoker Co., Ltd.—Two B 8 gear-driven mechanical stokers with mechanical draught.
Wm. Cory & Co., Ltd.—1,000 tons of slack coal at 15s. 7d. per ton delivered to Electricity Wo ks.

Chesterfield.—The T.C. has accepted the following tenders :—

Marsden Bros.—Sub-station, Whittington Moor, £205.
Chas. Ross, Ltd.—Girders for switch gallery, £14.
B.I. & Helsby Cables, Ltd.—1,200 yds. low-tension triple-concentric armoured cable, £294.
Brush Electrical Engineering Co., Ltd.—Two trailer car bodies, £80 each.

Government Contracts.—The following tenders have been accepted during the past month by the Government departments named :—

War Office.

Electric cable.—Callender's Cable and Construction Co., Ltd.
Carbons.—General Electric Co., Ltd.
Cable laying and jointing, R.M. College, Sandhurst.—W. T. Henley's Telegraph Works Co., Ltd.

Crown Agents for the Colonies.

Cables.—B.I. and Helsby Cables, Ltd.
Electrical equipment for wagon turntables.—Craven Bros., Ltd.
Telegraph poles, &c.—Bullers, Ltd.
Switchboards.—Siemens Bros. & Co., Ltd.

India Office.

Telegraph apparatus.—Automatic Telephone Manufacturing Co.
Cable.—Siemens Bros. & Co.
Insulator cups.—Bullers, Ltd.
Dynamo parts.—J. Stone & Co.
Insulators.—Bullers, Ltd.
Lightning arresters.—General Electric Co.
Perforator.—Gell Telegraphic Appliances Syndicate.
Standards, &c.—Siemens Bros. & Co.

Post Office.

Electric lifts, Battersea Post Office.—Wadsworth & Sons, Ltd.
Telephone exchange equipment, Chepstow.—Automatic Telephone Manufacturing Co., Ltd.
Telephone exchange equipment, Darlington.—Western Electric Co., Ltd.
Telephone exchange equipment, Lee Green, S.E.—Western Electric Co., Ltd.
Telephone exchange equipment, War Office, S.W.—British L. M. Ericsson Manufacturing Co., Ltd.
Telephone exchange equipment, Purley.—Western Electric Co., Ltd.
Telephone apparatus.—B.I. and Helsby Cables, Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; Western Electric Co., Ltd.
Battery boxes.—Standard Woodwork Co., Ltd.
Telephonic cable.—Connolly Bros., Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Dessicators.—Norman, Dickson, Pringle & Co.
Strip india-rubber.—B.I. and Helsby Cables, Ltd.
Telegraphic ironwork.—Bullers, Ltd.; F. W. Cotterill, Ltd.; Guest, Keen and Nettlefolds, Ltd.; T. W. Lench, Ltd.
Porous pots.—C. T. Maling & Sons.

Harwich and Dovercourt.—In connection with the electrification of the sewage pumping station, the T.C. has accepted the tender of the Rees Roturbo Co. for pumps, at £1,098.

Heywood.—The T.C. has sealed an agreement with the Tudor Accumulator Co., Ltd., for the repair and maintenance of the battery at the electricity works.

Melton Mowbray.—Subject to the consent of the L.G.B. to a loan, the U.D.C. has accepted the tender of Messrs. Dawson and Manfield for a refuse destructor.

New Zealand.—The Government contract for the whole of the equipment of automatic telephone apparatus, for which tenders were recently called, has been placed with the Western Electric Co., Ltd, whose local agents are Messrs. Arthur D. Riley & Co., Ltd., Wellington. The system is to be full automatic, and provides for coin-box telephones, party line working, private branch and satellite exchanges, &c. The contract now placed is for the equipment of six towns, of which the following are the approximate details :—

	Present equipment.	Ultimate equipment.
Wellington	5,500	14,500
Auckland	6,500	14,000
Blenheim	600	2,000
Hamilton	800	2,000
Masterton	800	2,000
Oamaru	600	2,000

A large proportion of the lines are for party working. The two firms tendering—viz., the Automatic Telephone Co. and the Western Electric Co.—each submitted a working model equipment, and the former had already supplied their apparatus for recent extensions at Auckland and Wellington. It is understood that the contract now placed will amount to about £100,000.

According to *New Zealand Shipping and Commerce*, the Christchurch City Council has accepted the offer of a private firm to supply 2,000 poles for the coming Lake Coleridge electric supply. "Councillor Scott was opposed to letting out any of the work in connection with the Lake Coleridge scheme to private firms without public tenders having been called for, especially when the contract ran into thousands of pounds."

Sherburn.—The P.C. received the following tenders for street E.L. extensions :—

S. Gillett & Co.	(accepted)	£ 6 10 0
J. H Stephenson		44 18 0
F. Reid, Ferens		46 7 0
S. Stobart & Co.		50 0 0
Fa'conar, Cross & Co.		52 10 0

Sunderland.—At a meeting of the T.C. on 13th inst. the Electricity Committee recommended that the following tenders be accepted :—

I.R. & G P., &c., Co.—19/20 cable.
B.I. & Helsby Cables, Ltd.—·15 cable, ·25 cable.
Ferranti, Ltd.—Meters.

The Council has also adopted the Tramways Committee's recommendation that the following offers be accepted :—

Hadfield's Steel Foundry Co.—Relaying a manganese railway and tramway crossing.
Tudor Accumulator Co., Ltd.—For welding 500 tramway rail joints.

Tynemouth.—The tender of Messrs. Dick, Kerr & Co., Ltd., has been accepted by the T.C. for a supply of lamps at 40 per cent. discount off the standard list.

FORTHCOMING EVENTS.

Salford Technical and Engineering Association.—Saturday, August 23rd. At 3 p.m. Visit to the Churchill Machine Tool Co.'s works at Frederick Road, Pendleton.

Institute of Metals.—Thursday and Friday, August 28th and 29th. Autumn meeting at Ghent, Belgium.

NOTES.

Results Obtained from Active Electric Cooking Campaign.—The American *Electrical Review* gives particulars of actual results accomplished by carrying out energetic electric cooking campaigns during the past few months by the commercial department of the Great Shoshone and Twin Falls Water Power Co., of Twin Falls, and the Southern Idaho Water Power Co., of Pocatello, Idaho. Early in the summer of 1912, the new business department of these two companies commenced a campaign of advertising, publicity, and education of the public in the use of electricity for cooking purposes. This was not done, however, until many tests had been made to determine the most reliable electric cooking devices that were available. The newspaper advertising was followed by a rapid succession of circular letters, tending to further interest the public in the advantages of the electric range over fuel ranges. Public demonstrations of electric cooking were held, and the people turned out by the hundred. At one exhibition in Twin Falls, over 1,000 people visited the display rooms in one day, and each one was served with a small portion of one or more daintily prepared, electrically-cooked foods. The demonstrations were followed up by a well-planned solicitation for the sale of electric ranges among the consumers.

During the fall of 1912, about 60 complete electric ranges of various sizes were sold. A car-load of American Simplex No. 7 ranges (125) was ordered during the winter, and practically all of the shipment has already been actually sold or spoken for. Five hotels and several restaurants and bakeries, during the past six months, have discarded all kitchen fuel, and are using electricity exclusively for all cooking and baking purposes. The greatest difficulty experienced, thus far, in the sale of electric ranges, is the fact that the customers have no means of disposing of their fuel ranges. Were the people able to dispose of their fuel ranges at anything

like a reasonable price, there would be no difficulty in selling 1,000 electric ranges during the current year.

The two companies referred to have adopted a rate of 2·5 cents per KW.-hour for current used for domestic cooking, and a guarantee rate schedule as follows for commercial cooking :—

COMMERCIAL COOKING RATES.

Monthly guarantee per KW. connected.	Rate in cents per KW.-hour.
$1.50	2
2.00	1.5
2.50	1.4
3.00	1.2
3.50	1

There has been found to be a marked diversity factor to be considered in determining the actual revenue obtained from electric cooking installations. This is especially true in the case of domestic electric range equipments. It is reasonable to consider three diversities, one due to the non-coincident use of all the ranges connected, one due to their being a separate switch for each heating element, and one due to the three-heat arrangement on each individual element. The maximum demand of the Simplex ranges used in Idaho is cut down by the use of a switch so arranged that the oven and broiler cannot both be connected at the same time. By this arrangement, the maximum demand of the No. 6 range is reduced to 3,215 watts, and of the No. 7 range to 3 510 watts. This has been found to result in little or no hardship on the one using the range, and is somewhat of an advantage to the electric service company. From the consumers' records of the companies it has been found that the average revenue from the domestic cooking ranges installed prior to April 1st, 1913, was $3.89 per range per month.

In another town where the rate is 3 cents per KW.-hour, the average monthly bills of three families using Hughes No. 40 ranges were $5.88, $2.75 and $1.45. Three other families using Hughes No. 30 ranges averaged $2.91, $3.32 and $3.56. A small hotel with the latter type averaged $5.74.

Inquiry.—Makers of magnetic lathe chucks are asked for.

Institute of Metals at Ghent.—On August 28th and 29th the Institute of Metals is to hold at Ghent its first foreign meeting. Metallurgists from all over the world will assemble in the Palais des Fêtes of the Exhibition, which has been placed at the disposal of the Institute by the Belgian Government. Prof. A. K. Huntingdon, Assoc.R.S.M., will preside.

The first session of the Congress will commence at 10 a.m. on August 28th, with an official welcome of the members on behalf of the University and the Municipality of Ghent. Afterwards, and during the morning of August 29th, there will be presented a number of important scientific papers, which will be read and discussed. Of these probably the most noteworthy is the second report to the Corrosion Committee, by Dr. G. D. Bengough, M.A., and Mr. R. Jones, B.Sc. This document will show that the experimental work which the Institute has been conducting at Liverpool for the past two years has yielded very practical results, indicating clearly not only the causes of the corrosion of condenser tubes, but how such corrosion may be eliminated.

Two foreign papers will be "The Specific Volume and Constitution of Alloys," by Dr. W. M. Guertler (Berlin), and "Copper Rich Alloys," by Prof. S. L. Hoyt (University of Minneapolis). English metallurgists will be well represented, Dr. T. K. Rose, Assoc.R.S.M., of the Royal Mint, presenting a paper on "The Annealing of Gold," and Dr. W. Rosenhain, F.R.S., and Mr. D. Ewen, M.Sc., both of the National Physical Laboratory, have an important paper on "The Intercrystalline Cohesion of Metals—Second Paper." Other contributions are by Mr. J. H. Chamberlain, M.Sc., on "A Further Study of Volume Changes in Alloys"; Dr. C. H. Desch and Mr. S Whyte, on "Micro-Chemistry of Corrosion : I. Some Copper-Zinc Alloys"; Mr. F. Johnson, M.Sc., on "A Method of Improving the Quality of Arsenical Copper"; Prof. A. A. Read, M.Met., on "The Influence of Phosphorus on some Copper-Aluminium Alloys"; and Mr. T. West, M.Sc., on "The Determination of Oxygen in Copper and Brass."

After the presentation of these papers, visits will be paid to the works of Messrs. Van de Kerkhove (engineers), and the manufacture of Diesel engines will be investigated at the works of Messrs. Carels Freres. One afternoon will be devoted to the International Exhibition, and a concert is being arranged for the first evening of the Conference, whilst on the last day there will be a Municipal Reception at the Town Hall by the Bourgmestre and Reception Committee.

Legal.—HIRING A MOTOR.—In the City of London Court, on Wednesday, before Judge Lumley Smith, K.C., a claim was made by Messrs. J. O. Grant & Taylor, electrical engineers, 62, Queen Victoria Street, E.C., against Mr. P. G. Fraser, 32 and 34, City Road, to recover the sum of £38 13s. 8d. for the hire of a motor and pan together with shafting and belting. The particulars were :—To running cables to motor as per estimate February 4th, 90 ft. run at 1s. 3d. per ft., £5 12s. 8d.; supplying and fixing main switches and fuses as per estimate, £1 15s.; cost of installing mill, hire of tackle and cartage and storage, £10 6s.; hire of motor and pan for 4 months, £21. Alternatively, the plantiffs claimed 5 gns. a month for 6 months. Harry Greenaway, plaintiffs' electrical engineer, said that the defendant instructed them to fix up a motor on premises at City Road, which they did. Defendant said that the motor was never put up properly and that it would never work. It had done him a lot of harm and damage and he would have to make a claim against the plaintiffs. The shafting was broken. The men whom plaintiffs sent to fix the motor were inefficient. Greenaway replied that the defendant had not given the motor the proper foundations. He had had the motor for six months ; the shafting was not broken.—Judge Lumley Smith found for the plaintiffs with costs.

TAYLOR *v.* LEYTON U.D.C.—On August 13th at the City of London Court, George Taylor, fish porter, was awarded £15 damages and costs against the defendant Council, for injuries and loss of earnings through being thrown from the top of a motor-omnibus by one of the defendants' tramcars, which overturned it.

ARON *v.* X.L. ELECTRIC CO, LTD, AND OTHERS.—The motion in this action, by which the plaintiff sought to obtain a writ of sequestration against the company and attachment of one of the directors for an alleged breach of an undertaking not to proceed with a resolution for a voluntary winding-up, was again before Mr. Justice Astbury as Vacation Judge on Wednesday, August 20th.

After hearing evidence filed on the motion, his Lordship intimated that he was not prepared to make an order. In his opinion, cross-examination of the witnesses on their affidavits was essential.

Mr. Moritz, for the defendants, asked that the motion should be dismissed with costs.

Mr. Simmons, for the plaintiff, submitted that there was ample ground for making the application.

His Lordship asked whether he was willing that the costs should be made costs in the action, or that they should be reserved to be dealt with at the trial ?—Mr. Simmons said he was.

Mr. Moritz pointed out that the action had been in abeyance for a long time, and might never come to trial.

After some further discussion, his Lordship said he would make no order on the motion, but would direct that the costs should be the defendants' costs in the action.

Institution Note.—SALFORD TECHNICAL ENGINEERING ASSOCIATION.—The next meeting (lecture on "Grinding Machines," by Mr. K. D. Morgan) will be held on September 20th instead of September 6th.

New Laboratory at Dundee.—The new engineering laboratory at University College, Dundee, is to be opened on October 14th by Sir Alexander Kennedy.

Royal Assent.—The following are among the Acts which have received the Royal Assent :—

Post Office (London) Railway Act.
Telegraph (Money) Act, 1913.
Tramways Orders Confirmation Act, 1913.
Electric Lighting Orders Confirmation (No. 1) Act, 1913.
Electric Lighting Orders Confirmation (No. 2) Act, 1913.
Electric Lighting Orders Confirmation (No. 3) Act, 1913.
Electric Lighting Orders Confirmation (No. 4) Act, 1913.
Electric Lighting Orders Confirmation (No. 5) Act, 1913.
Electric Lighting Orders Confirmation (No. 6) Act, 1913.
Electric Lighting Orders Confirmation (No. 7) Act, 1913.
Wemyss Tramways Order Confirmation Act, 1913.
Richmond (Surrey) Electricity Supply Act, 1913.
Chesterfield Corporation Railless Traction Act, 1913.
Wimbledon and Sutton Railway Act, 1913.
Westgate and Birchington Gas and Electricity Act, 1913.
Metropolitan District Railway Act, 1913.
Metropolitan Railway Act, 1913.
Rhondda Tramways (Railless Traction) Act, 1913.
Mexborough and Swinton Tramways (Railless Traction) Act, 1913.
Kent Electric Power Act, 1913.
Central London Railway Act, 1913.
London Electric Railway Act, 1913.
London County Council (Tramways and Improvements) Act, 1913.
Metropolitan Electric Tramways (Railless Traction) Act, 1913.
City and South London Railway Act, 1913.
Western Valleys (Monmouthshire) Railless Electric Traction Act, 1913.

Fatalities.—A correspondent says that "two miners were killed on Friday night in Moor Green colliery, Nottingham. A gang of men were working at an electric holing machine, which cuts out of the coal face, when two of them, Edward Clarke and Edward Spalding, both of Eastwood, received an electric shock. Spalding was killed as the result of the shock. Clarke was thrown right on to the machine, his body being caught by the driving wheel of the drill and whirled round at a terrific speed. Practically nothing but pulp remained."

It is reported that a collision between a touring car and a telephone pole at Hoboken, New Jersey, on Friday evening caused an alarming electric display resulting in the chauffeur receiving a fatal shock. The car was running at high speed and carried the pole some 30 ft. before it turned turtle amid a network of blazing wires. The fact that the rubber tires held down several wires saved the lives of the owner of the car, Mr. Alexander Negill, a Jersey City manufacturer, and a friend. They were eventually taken from the wreck severely burned and suffering grave injuries, and lay unconscious in hospital.

The Moulders' Strike.—It is stated that the strike of moulders at Sheffield was brought to an end on Monday by the return of the men pending consideration of the matters in dispute at a joint conference of the Masters' Association and representatives of the Ironfounders' Society.

Value of Kyanising in the Preservation of Various Pole Timbers.—Poles preserved by the Kyan process, *i.e.*, impregnated with mercury chloride (corrosive sublimate) solution, are now used to a great extent on the Continent, particularly near towns where their clean appearance and the possibility of painting them are important advantages. In southern countries in particular, kyanised timber is very popular. Where wooden poles are used to support electrical conductors of one description or another, it is important to realise great and uniform durability against attack by rotting and insect pests. The timbers which have usually to be considered in Europe in this connection are pitch pine, Scotch fir and larch, and it is important to ascertain whether kyanising gives equally satisfactory results with pine and fir, and if not, what modification had best be made in the process to ensure the best and most uniform results.

As is well known, the general process of kyanising consists in steeping the air-dried timber for 14 days in a weak solution of corrosive sublimate (often as weak as 0·7 per cent. of mercury salt). The nature of the wood is naturally of great importance in determining the quantity of solution absorbed; even assuming equal dryness of the timber prior to impregnation, pitch pine absorbs much less solution than Scotch fir, and this characteristic is noticeable in other impregnating processes as well as in kyanising. Tests with solutions of a number of metallic salts show that pitch pine absorbs about 0·4 times as much solution as Scotch fir in a given time but, in most cases, the impregnating solution is absorbed as such. Where mercury chloride solution is employed, however, the timber absorbs a greater percentage of the salts than of the solvent, so that the solution soon becomes deplenished of chloride, and must be restored to the desired strength by the addition of strong mercury chloride solution. As a consequence of this selective absorption, it is not sufficient to record the amount of solution absorbed by timber during kyanisation; the important factor is the actual amount of corrosive sublimate absorbed. It is a well established fact that air-dried pitch pine absorbs considerably less sublimate in a given time than does Scotch fir equally well seasoned, and since the durability of the timber in service depends on the protective action of the sublimate, it is necessary to secure equal proportions of the latter in the treated timber. Different timbers must be kyanised separately, and whereas seven days' immersion of air dried barked Scotch fir may suffice, at least 10 days' immersion is required for the sufficient impregnation of pitch pine.

From observations made in connection with the kyanisation of telegraph poles for the Austrian Government, R. Nowotny (see also *Elek. u. Maschinenbau*, XXXI, p. 511, *et seq.*) says that 1 cb. m. of pitch pine timber absorbs about 1 kg. of corrosive sublimate in the course of 10 days' immersion in kyanising solution. The same proportion of chloride was absorbed by Scotch fir during seven days' immersion but by extending the impregnating period to ten days in the case of the pitch pine an equally durable timber was obtained. Naturally absorption proceeds more rapidly during the first days of immersion than towards the end of the impregnating period, thus whereas the average rate of absorption was 0·1 kg. of chloride per cu. m. per day in the case of the pine wood, the total absorption after seven days' immersion was 0·8 kg. per cu. m.

Kyanisation being a low pressure impregnating process, the penetration of the solution is limited to a few mm. depth from the surface of the wood and the salt absorption per unit surface area of the timber is therefore insignificant. It is found that pitch pine absorbs 0·033 kg. of chloride per cu. m. of surface area during seven days' immersion and 0·042 kg. during ten days' immersion, whereas Scotch fir absorbs 0·045 kg. per sq. m. of surface during seven days impregnation.

The above absorption data represents the highest degree of impregnation which can practicably be obtained by kyanisation and considerably lower degrees of saturation are frequently employed. For pine, an absorption of 0·6 kg. of sublimate per cu. m. (0·0375 lb. per c. ft.), *i.e.*, 0·03 kg. per sq. m. (0·0062 lb. per sq. ft.), of surface is generally considered sufficient. The chief conditions for success are that the timber be thoroughly air-dried by prolonged stacking in such place and manner as to permit free access of air to the poles; and that the poles be completely freed from bark (the outer skin of the heart wood being also removed by the stripping tool) at least two months before the taking process. By varying the period of immersion, the absorption of the sublimate can be varied (up to a certain maximum), and timbers of various kinds can be rendered equally impervious to attack and decay.

Directors' Contra Account. What is Ultra Vires?—In the City of London Court on Wednesday, before his Honour Judge Lumley Smith, K.C., Wakelin Bros., Ltd., electrical engineers, 3, Fenchurch Street, E.C., claimed £20 7s. 11d. against Messrs. D. McGregor & Son, bootmakers, 76, Tottenham Court Road, for electrical goods supplied. Defendants paid £10 3s. 9d. into Court and £5 18s. was abandoned by the plaintiffs. Defendants raised a set-off for boots and shoes supplied to Mr. J. F. Wakelin, the managing director of the plaintiff company, and Mr. Tibbs, one of the directors. Mr. Hatch, plaintiffs' solicitor, said that the company was in liquidation and that the liquidator was suing. Defendants could not set off for boots and shoes supplied to anyone other than the company itself, and the company did not have the boots and shoes. Mr. Wakelin, called for the defendants, said that the company owed him and Mr. Tibbs considerable sums of money; and it was agreed at board meetings that they should have boots and shoes from the defendants, and that those items should be treated as contra. It was a practice for all four directors to run contra accounts.—Judge Lumley Smith said that the liquidator was no party to the contras. He was bound to collect the debts of the company.—Mr. Hatch urged that the contras would be *ultra vires*. The directors could not take goods for themselves and ask the company to pay the accounts.—Judge Lumley Smith: One never knows what is *ultra vires* in these days.—Mr. Wakelin added that the directors did not draw their full salaries, and that was why they had the arrangements which he had put forward.—Judge Lumley Smith: Contra means something that this electrical company was going to have. The company was not going to wear boots and shoes. Mr. McGregor said that the plaintiffs had been doing electrical work for them for 20 years in fitting up one boot and shoe shop after another. The contras had been going on all the time.—Judge Lumley Smith said that judgment must be given for the plaintiffs for £4 6s. 2d. beyond the amount paid into Court and costs. Defendants must get the money for the boots and shoes from Wakelin and Tibbs.

The Paris Telephone System.—According to the *Times*, a number of improvements have lately been introduced in both the urban and the inter-urban telephone services of Paris. As regards the urban service, the Paris telephone system comprises about 100,000 stations, which communicate with each other by means of 11 exchanges. The annual growth in the number of subscribers, which was 3,387 in 1910, reached 5,648 last year. To cope with the increase in the traffic two new exchanges are being provided on the right bank of the river, and one on the left bank, to relieve existing exchanges, and the three temporary exchanges which, after the fire of 1908, were installed in the Rue Gutemberg, have been transferred to the Hôtel Téléphones. For the inter-urban system 530 circuits converge on Paris, 20 being international, 263 inter-urban, and 247 suburban. The circuits are carried to the new exchanges in the Rue des Archives, the equipment of which is of the most modern character.

Canadian Opportunities.—A piano manufacturing company has commenced the erection of a factory in Nova Scotia, and will require time-recording clocks, motors, generators, boilers, and fire extinguishers.

A company has recently been formed in Quebec Province, with a capital of $149,000 (about £30,600), to carry on the business of electricians, engineers, machinists and manufacturers, and to acquire and exploit water power for the purpose of generating electrical energy. The names of the companies, &c., to which the foregoing notices relate may be obtained on application to the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.

Copper.—The bi-monthly statistics issued by Messrs. H. R. Merton & Co. show a continued falling-off in the figure for visible supplies, though the differences from month to month are not so heavy as might be anticipated in a period of brisk demand. English stocks, on August 15th, were 18,131 tons, against 18,037 tons on July 31st, thus actually registering a small increase. French stocks had dropped 268 tons. European stocks were 1,249 tons less, but, for the whole of Europe, including estimates, this figure is reduced to 962 tons.

Supplies during the fortnight ending August 15th from North America were above the average, from Spain and Portugal low, from Chile and Australia average. Deliveries, at 27,371, bid fair to be above the average. American stocks increased 308 tons during July, the figure at the end of that month being 23,926 tons. The world's visible supply, including Holland and Germany, stood at 59,553 tons on July 31st, having lost 2,261 tons during the month.

Electro-chemical Industries in Norway.—H.M. Consul at Christiania (Mr. E. F. Gray) reports that, according to the local Press, an association of the chief Norwegian undertakings and firms connected with the electro-chemical and electro-metallurgical industries has recently been formed under the title of the "Norsk Forening for elektro-kemisk og elektro-metallurgisk Industri."—*Board of Trade Journal.*

Accidents.—On the 15th inst. at the Rochester Gas Works, an explosion, followed by fire, caused considerable damage to the works and serious injury to Reginald Jennings, an employé. The retorts are fed by an electrical hopper, and while the operation was in progress at 8 o'clock a.m., an electrical wire fused. An explosion among the coal dust followed, and this set fire to the coal in the hopper. Jennings pluckily tried to stop further mischief by closing the hopper, and did not desist till he had been seriously burned about the face and hands. He was removed to the local hospital in an unconscious state.

A correspondent writes:—"A serious accident occurred on the newly-electrified railway between Bury and Holcombe Brook on Wednesday, August 20th. One of the cars was driven up on a siding, and workmen were engaged upon it. One of them named John Bennett, of the tin-plate works, Newton Heath, who is employed on the contract, got on to the top of the car to attend to the bows that run on the overhead wires. The ladder on which he was standing slipped, and to save himself he grabbed one of the bows of the car. Unfortunately the other bow was connected with the wire, and he received an electric shock of great severity. He was removed to Bury Infirmary."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Bailie W. B. Smith, Convener of the Glasgow T.C. Electricity Department, and Mr. W. W. Lackie, Chief Engineer of the Electricity Department, left on Friday evening last week from Princes Dock per ss. *Grampian* for America. They expect to arrive at Montreal about August 24th, whence they will proceed to Toronto to view the electric generating plant at Niagara Falls. They will examine several large power stations at Chicago and thereafter proceed to Pittsburg where Bailie Smith will attend a conference on smoke abatement. After seeing the works of the G.E.C. and Westinghouse Companies, a visit will be paid to New York to inspect the large power stations there. They are due back in Glasgow about October 5th.

At St. Etheldreda's, Ely Place, London, on August 14th, the marriage took place of Mr. J. Waldron Bussey, of the Great Eastern Railway electrical engineer's department, and Miss Olga M. Bishop, second daughter of the late R. Bishop, of Yokohama.

An Australian exchange states that Mr. V. Hutchinson, formerly of Hobart, has been appointed municipal electrical engineer at Brunswick (Vic.).

The Ealing B.C. has fixed the following salaries from the 1st prox.: Mr. C. B. Heaviside (shift engineer), 50s; Mr. S. F. Riddle (shift engineer) 45s. to 47s. 6d.; and Mr. P. Anley (installation inspector), 50s. The Council has, on the recommendation of its Electricity Committee, appointed a special Committee to consider the payment of wages during illness.

Mr. G. B. Wheeler, of Southport electricity works, has been appointed chief assistant engineer at the Hamilton electricity works.

Mr. G. G. Deeley has been appointed senior charge engineer at Southport electricity works, and Mr. S. Pendlebury as assistant mains superintendent at Southport.

General.—Mr. Robert Hammond is, we understand, starting for South Africa on the 30th inst., by the R.M.S. *Edinburgh Castle*.

Indian Engineering says that Sir C. S. Wilson, on completion of his leave, has been permitted to resign his post of Director-General of Posts and Telegraphs, and will retire from the service.

Mr. Hamylton Rigg has severed his connection as sales engineer with the Electrical Power Storage Co., to accept a similar post with Edison Accumulators, Ltd., of 49, Old Bond Street. His private address will be at Manchester as hitherto.

The *Daily Telegraph* states that Sir Alexander King, Secretary to the Post Office, has appointed Mr. T. R. Gardiner to be his private secretary in place of Mr. C. L. K. Peel, promoted.

On the 18th inst. at St. Paul's Church, Rock Ferry, Cheshire, Mr. H. Eaton, of the electrical department, Anchor Thread Mills, Paisley, and youngest son of Captain Eaton, was married to Miss Olive Blanche Forrester, youngest daughter of Mr. Richard Forrester, of Birkenhead.

We learn that Mr. W. Young, late London manager of the Sunbeam Lamp Co., has just relinquished his office with the G.E.C., which he joined some 14 months ago, to take up the representation in London of the Cryselco Co., of Bedford. Mr. Young has had a long and varied experience of the lamp business, his connection on the commercial side of the industry dating back to the early days of carbon lamp making by the Edison & Swan Co., with whom he spent a number of years in responsible capacities. His friends, who number many in the lamp world, will join us in wishing him every success. His business address will be care of Cryselco, Bedford, and his private address, 14, Leander Road, Thornton Heath.

Messrs. Ferranti, Ltd., announce that Mr. H. Greaves has been appointed to the position of buyer—Mr. J. Robinson being unfortunately compelled to resign on account of ill-health. Suppliers are asked to send on to Hollinwood copies of their latest catalogues.

The *Daily Telegraph* states that Sir Alfred Hopkinson, K.C., lately Vice-Chancellor of the University of Manchester, is proceeding to India in October to advise the Senate of the University of Bombay in regard to questions of administration and organisation, and to inspect the working of the affiliated colleges.

Obituary.—Mr. A. D. Williams.—The death has taken place, after a long illness, of Mr. Arthur Doughton Williams, who was associated in business with his father, Mr. Thos. Williams, electrical and general engineer, Aberystwyth. Deceased, who was only 28 years of age, had carried out some important electrical work in the district, including the equipment of the Lisburne Mines.

Mr. W. Thom.—We regret to record the death of Mr. W. Thom, head of Messrs. Yates & Thom, of Blackburn, which occurred on August 13th, at the age of 72 years. Mr. Thom retired from the business, retaining his interest, several years ago.

NEW COMPANIES REGISTERED.

Igranic Electric Co., Ltd. (130,660).—This company was registered on August 14th, with a capital of £35,000 in £1 shares, to carry on the business of electrical engineers, manufacturers of electrical apparatus, &c., to acquire established businesses manufacturing or dealing in electric control gear, including the business recently carried on by the Adams Manufacturing Co., Ltd., as manufacturers of "Igranic" electric apparatus, &c. The subscribers (with one share each) are:—G. R. Thursfield, 147, Queen Victoria Street, E.C. engineer; M. A. Doggett, 147, Queen Victoria Street, E.C., engineer. Private company. The number of directors is not to be less than two or more than five; the first are F. R. Bacon, F. L. Pierce, A. W. Berresford and G. A. Mower. Registered office, 147, Queen Victoria Street, E.C.

British Railway and Tramway Interchangeable Rail Co., Ltd. (130,629).—This company was registered on August 13th, with a capital of £15,000 in £1 shares, to acquire Patents No 646 of 1911, and 2,466 of 1913, for improvements relating to tramway and the like rails, and to adopt an agreement with H. Crudgington and H. T. Wakelam. The subscribers (with one share each) are:—H. Crudgington, Alcester Road, King's Heath, metal merchant; F. W. Alabaster, 106, Moseley Road, Birmingham, merchant. Private company. The number of directors is not to be less than two or more than seven; the first are F. N. Layman, E. Randle, E. Grantham and H. Crudgington; qualification, 100 shares. Registered office, 28, Victoria Street, S.W.

Mitchelite Lighting Co., Ltd. (130,661).—This company was registered on August 14th, with a capital of £25,000 in 5s. shares (50,000 6 per cent. cum. participating preferred), to acquire any inventions relating to the production, treatment, storage, application, distribution and use of gas, petrol and electricity, and to adopt an agreement with C. H. Purvis. The subscribers (with one share each) are:—W. O. Jones, 88, 89 and 90, Chancery Lane, W.C., solicitor; C. Boyle, 76, Bisson Road, Stratford, E., clerk; Miss Grace M. Maund, Maythorn, Chaplin Road, Wembley; W. J. Ealey, 74, Masbro' Road, West Kensington, secretary; Bessie J. Hosking, 8, Louise Road, Stratford, E., clerk; Mary L. Tristram, 62, Stanhope Gardens, N., clerk; A. C. Rivers, 51, Murchison Road, Leyton, N.E., clerk. Minimum cash subscription, £14,000. The number of directors to be not less than four or more than 10; the first are T. D. Stubbs, B. B. Sanders, A. W. Heron-Maxwell, C. Hugh Purvis, S. L. Elphinstone-Cliff and J. W. M. Purvis; qualification, £105; remuneration, two guineas each per meeting attended. Registered office, 161, Piccadilly, W.

Reineke's Wireless Telephones, Ltd. (130,667).—This company was registered on August 14th, with a capital of £25,000 in 22,000 preference shares of £1 each and 60,000 ordinary shares of 1s. each, to acquire from L. W. Holmes, of 48, Great Russell Street, W.C., the benefit of an agreement between Josef H. Reineke, of the first part, the Studien Gesellschaft of the second part, Geo. A. Kubler of the third part, and the said L. W. Holmes, of the fourth part, and the full rights and interest of the inventor in the process or system of wireless telephony for mines invented by the said J. H. Reineke. The subscribers (with 500 preference shares each) are:—L. W. Holmes, M.I.E.E., 48, Great Russell Street, W.C., electrical engineer; G. MacElwee, 62-7, Norfolk House, Norfolk Street, W.C., gentleman; E. Denholm Young, 15, Rutland Street, Edinburgh, W.S. Private company. The number of directors is not to be less than three or more than ten; the first are Sir Archer Croft, Bt., L. W. Holmes, M.I.E.E., G. MacElwee, E. Denholme Young, W.S., and Gordon S. Goldie; qualification £500 preference shares; remuneration £150 each per annum (£50 extra for the chairman) and a percentage of the profits. Registered office, Norfolk House, Norfolk Street, W.C.

Davy Lamp Igniter Co., Ltd. (130,633).—This company was registered on August 13th, with a capital of £6,000 in £1 shares (500 preference, 1,000 ordinary and 400 founders'), to acquire any invention relating to machines or apparatus for the ignition of safety or other lamps, to carry on the business of manufacturers and repairers of, agents for and dealers in, electric igniters, lighters or relighters adapted for use with safety or other lamps, electrical engineers and contractors, &c., and to adopt an agreement with A. Paxton. The subscribers (with one share each) are:—A. Paxton, 5, Welfa Street, Roath, Cardiff, electrical engineer; H. W. C. Hinchley, 348, Whitchurch Road, Cardiff, commercial traveller. Private company. The number of directors is not to be less than three or more than five; the first are not named; qualification, £100 shares. Solicitor, W. Jones, Swansea. Registered office, Tynycoed Place, Cardiff.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Priestman Brothers, Ltd.—Mortgage or charge dated March 19th, 1901, created to secure £42,500 "A" and £11,500 "B" debenture stock, has been cancelled pursuant to the Scheme of Arrangement which was sanctioned by the High Court on July 1st, 1913, and has been notified. Particulars of £21,250 debenture stock, created August 8th, 1913, pursuant to a Scheme of Arrangement and secured by trust deed of even date, also filed, pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the whole amount being now issued. Property charged: The company's property, present and future, including uncalled capital and engineering works, lands, buildings and premises in Williamson Street, Thomas Street, and James Street, Hull, with machinery, &c., thereon, and land with warehouse thereon in Williamson Street. Trustees: Sir James Reckitt, Bart., Swanland Manor, Yorks.; and A. T. Watson, Sheffield.

Bristol Tramways and Carriage Co., Ltd.—Acknowledgment of indebtedness dated July 24th, 1913 (supplemental to trust deed dated January 24th, 1908), to secure £125,000 deb. stock, ranking *pari passu* with £250,000 like stock issued under principal deed, charged on all the company's property, subject to original deed. Holders: Sir George White, Bart., Cotham House, Bristol; and S. White, Dorset House, Clifton, Bristol.

British Westinghouse Engineers' Club, Ltd.—A memorandum of satisfaction in full on July 14th, 1913, of deb. dated June 17th, 1908, securing £675, has been filed.

Marbro, Ltd. (105,619).—Particulars of £250 second debentures, created July 16th, 1913; filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £150. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Return dated July 30th, 1913 (filed August 6th). Capital, £2,000 in £1 shares (1,500 pref. and 500 ord.); 752 pref. and 500 ord. shares taken up; £1 per share called up on 502 pref.; £500 paid, leaving £2 in arrears; £750 considered as paid on 250 pref. and 500 ord. Mortgages and charges: £1,000.

Llanelly Motor and Electrical Engineering Co., Ltd.—Mortgage on land with garage, shops and offices thereon in Llanelly, dated July 30th, 1913, to secure all moneys due, or to become due, from the company to National Provincial Bank of England, Ltd., 15, Bishopsgate, E.C.

Foster Engineering Co., Ltd.—Particulars of £9,000 second debs., created July 30th, 1913, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £8,484. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Lea, Son & Co., Ltd.—Mortgage on certain freehold land in Stafford, dated July 22nd, 1913, to secure all moneys due, or to become due, from the company to London City and Midland Bank, Ltd., 5, Threadneedle Street, E.C.

Midland Electric Corporation for Power Distribution, Ltd.—A memorandum of satisfaction in full on July 11th, 1913, of charge dated July 29th, 1903, securing £250,000, has been filed.

CITY NOTES.

Manaos Tramways and Light Co., Ltd.

THE fourth ordinary general meeting of the shareholders of the above company was held on August 14th, at the offices, 9, Cloak Lane, E.C., Mr. G. M. Booth presiding.

In moving the adoption of the report (see ELECTRICAL REVIEW, page 227), the CHAIRMAN, after referring to the resignation of Mr. J. Mitchell from the chairmanship, said that they had to report that the expectations, entertained a year ago, that the State of Amazonas would liquidate its debt to the company for the public lighting of the City of Manaos, had unfortunately not been realised. No payment whatever had been made by the State on this account during the year, and the total debt for public lighting on April 30th, 1913, amounted to £23,676. Every endeavour had been made to obtain some payment on account, but the State Treasury was denuded, and claimed that its revenues, dependent entirely upon the export tax levied upon rubber, had decreased to such an extent that for the present at any rate they could not meet their liabilities. The directors felt strongly about this matter, and considered that it was particularly hard on the company, in view of the fact that they on their part had carried out loyally every single obligation of their State contract. They continued to exert pressure on the Treasury. The position in the State Treasury arose from the fact that the Government of Amazonas collected, and this was practically its sole revenue, about 20 per cent. *ad valorem* on an article which has been steadily falling in value. It was common knowledge that the price of rubber had fallen more than 50 per cent., and the present price of Para fine rubber in London, viz., 3s. 10d. per pound, was lower with one exception, viz., the period between October, 1907, and March, 1908, of the American financial crisis, than had been seen for a generation. He did not think that it was so low that trading conditions could not adjust themselves to it, but after a period of great extravagance and undue prosperity time was needed for adjustment to harder conditions, and the period of this adjustment was bound to be one of restricted trading. In tropical countries the facilities offered by tramway and electric lighting services were so necessary to comfort, that the population would continue to enjoy them at the expense of other economies, and while at the present juncture they could not look for much expansion in their revenues, he did not apprehend any serious contraction, and he believed the Amazon Valley would ultimately benefit from being compelled, by these difficult times, to adopt practices of economy and more businesslike methods and principles of conducting its great rubber industry. Turning to the accounts during the year under review, the tramway receipts amounted to £106,148, as against £109,718 for the previous year, a decrease of £3,570; the lighting receipts amounted to £44,148, as against £35,602, an increase of £8,546; the total gross income increasing from £147,290 to £151,741. The total operating expenses had decreased from £112,634 to £101,942 (the ratio of operating expenses to gross receipts had fallen from 76½ per cent. to 67·2 per cent.) and their net surplus had increased from £16,318 to £28,107, an increase of over 72 per cent. Capital expenditure during the year amounted to £21,509. This expenditure was mainly due to extension of track work necessary under the terms of the concession, and the additions, when completed, would improve operating conditions. They had also paid for the four large cars mentioned in last year's report. Additional expenditure on capital account had also been required to meet the demands of new consumers in the private lighting department, the number of lamps for private lighting having been increased by nearly 26 per cent. Coming to the recommendations for the appropriation account, it would be seen that they proposed to set aside £16,000 to various reserves. They recommended that £10,000 of this total should be transferred to the contingencies and accident reserve account. In the course of the year they had had to write off from this account £4,274 to meet a payment against an old accident claim. The amount appeared large, but it was much less than that originally claimed, and while there were one or two old claims still outstanding, they trusted that no heavy damages would result, no serious accidents having occurred during the last three years. Deducting this amount, and adding the £10,000 mentioned before, raised the sum to the credit of this account to £15,725. They proposed to credit renewals reserve with £6,000, making a total to the credit of this account of £21,000. Out of the final balance of £15,435 they recommended the payment of a dividend of 4 per cent., absorbing £12,000, the balance of £3,435 to be carried forward. The property had been maintained in excellent condition, and they were fortunate in being able to retain the services of Mr. Kirk, their manager in Manaos, who, supported by an effective staff, was doing everything possible to make the undertaking successful.

MR. W. C. BURTON seconded the motion.

Replying to questions, the CHAIRMAN said he believed that the reduction in the tramway receipts was due to the fact that the whole Amazon valley had been depressed, that fewer people had gone to Manaos. Speaking generally, there had been a steady increase in the tramway receipts all over Brazil, due to the fact that the country was getting more highly civilised, and ladies could now go about and do their shopping by themselves. Their own accounts were really better than the 4 per cent. dividend, but they wished to be well prepared for any eventualities that might occur in the next two or three years. So far they were ahead in their receipts, as compared with this time last year, but if they had as good a year as last, he would be satisfied. He was afraid there was not much chance of reducing the operating expenses further, as the country was a very expensive one to work in. They were still supplying the city with light, as, indeed, they were bound to under their contract, and he need hardly say that the directors were giving close and anxious attention to the debt which the Government owed them. The report was adopted.

Marconi's Wireless Telegraph Co., Ltd.

THE directors state in presenting their report for the year ending December 31st, 1912, that as it was not found possible to complete the audit until comparatively recently, they deferred the submission of their report, they having entered into a new contract with the Postmaster-General and considered it desirable to await its ratification by Parliament.

In the report for the year 1911, it was stated that the share premium account would be increased in the next balance-sheet to the sum of £256,630. The balance-sheet now presented shows this this figure standing at £255,707, the expenses in connection with the issue (£923) having been debited. During 1912 the business continued to make satisfactory progress, the gross profit having amounted to £537,243 as compared with £214,407 for 1911, and a net profit is carried to the balance-sheet of £413,295, as compared with £141,717 for 1911. A part of the above profit having been derived from the realisation of shares, the directors deem it prudent to take this opportunity of creating a reserve account and have appropriated £100,000 for this purpose. The directors recommend the payment of a final dividend for the year 1912 of 10 per cent. on both classes of shares. Summarised, the proposed appropriation of the available balance is as follows:—

Preference Shares—Dividend of 17 per cent. for year ended December 31st, 1912, of which 7 per cent. was paid on August 1st, 1912	£42,500
Ordinary Shares—Dividend of 20 per cent. for year ended December 31st, 1912, of which 10 per cent. was paid on August 1st, 1912, on the amounts paid up on July 8th, 1912...	149,921
General reserve account	100,000
Balance carried forward to next account	146,726
	£439,147

The directors propose to declare at the general meeting, which is to be held to-day at the Hotel Metropôle, a dividend at the rate of 7 per cent. for the year 1913 on the preference shares.

In the balance-sheet, patents and shares in associated companies are again taken into account at their cost price, with the exception of the Spanish shares and a portion of the American shares, which figure at their par value. The directors desire to draw the attention of shareholders to these words, for notwithstanding that the same statement was made in the directors' report for the year 1911, misunderstanding arose in the minds of some in consequence of its having been stated by some that the profits appearing in the balance-sheet had been arrived at by means of writing up the shares held in associated companies. In order that there shall not be any misunderstanding of this nature in the future the directors desire to make it clear that whenever shares are acquired by the company they figure in the margin of the balance-sheet at their par value, and no matter what that total may represent they are taken into account in the balance-sheet only at their actual cost price to the company. To this figure is added the cost of patent renewals, patent applications, and any sum which may be paid in acquiring or protecting patents. Thus in the balance-sheet now submitted the £856,119 represents the cost to the company of the whole of its patents and shares in associated companies, the latter being represented in the margin at their par value of a total of £1,594,584. Whenever the company sells any portion of its share holding the share and patent account is credited with the average or actual cost price of the shares, including a proportion of the cost of patents as stated above.

The total cost of shares and patents shows an increase over the figures of the preceding year of £347,596. This is accounted for largely by the addition of shares in the American Co. which were acquired at par.

The total par value of shares shows a decrease as compared with the preceding year of £480,140. This arises principally in consequence of the re-adjustment of the capital of the Argentine Co. The Argentine directors considered that the capital of the company which was formed in 1906 with a capital of $6,750,000, of which $6,000,000 was in "A" shares of $5 each, and $750,000 in "B" shares of $5 each, was excessive, and this company has consented to the cancellation of 200,000 "A" shares, of which this company's proportion was 155,898, and that one new "AA" share should be exchanged for four shares of the original capital. It has also been agreed that the "B" shares, of which this company holds 78,250 of a total of 150,000, and which rank preferentially as regards capital, shall receive a preferential dividend of 5 per cent., and an increased proportion of any remaining profits.

By these arrangements this company's holding in the Argentine Co. shows a nominal decrease in the par value of its "AA" shares of £676,781, and an increase in the value of its "BB" shares of £5,325, paid in respect of calls on these shares. This company's interest in the Argentine Co. is, therefore, practically unchanged; the alteration affects the number of shares and their nominal value only.

With the development of the wireless industry throughout the world, the business of the associated companies in which this company is interested is extending considerably.

Belgian company (Compagnie de Telegraphie sans Fil).—The business of this company has continued to increase and show very satisfactory profits. It has recently been reorganised, and its capital increased to £90,000, of which this company holds one-third.

French company (Compagnie Francaise Maritime et Coloniale de Telegraphe sans Fil).—This company has declared a dividend for the year 1912 of 10 per cent. on the ordinary shares and 31·25 fr. per share on the founders' shares.

Marconi International Marine Communication Co., Ltd.—The business of this company during the year 1912 showed an increase of over 60 per cent in its receipts, and a dividend of 10 per cent. was declared, an increase of 3 per cent. over that of the preceding year. The company's business continues to develop in a very satisfactory manner.

German Company (Deutsche Betriebsgesellschaft fur Drahtlose Telegraphie m.b.H.) (Debeg.).—This company has paid a dividend of 8 per cent. for the year ending September 30th, 1912.

Russian Company (Société Russe de Télégraphes et Téléphones sans Fil).—This company has declared a dividend for the past year at the rate of 6 per cent. Its business continues to show very satisfactory development, and the business in hand this year represents a very substantial increase over that of the preceding year.

Marconi Wireless Telegraph Co., of Canada, Ltd.—Under their contracts with the Canadian Government for the operation of wireless telegraph stations on the Great Lakes, four stations have been established and placed in operation during the past year. One station is at present being enlarged and three other stations are to be built during the current year. The negotiations with the Newfoundland Government were brought to a satisfactory termination in December by the completion of a contract which will continue the company's exclusive rights in Newfoundland until the year 1926. Under agreements with the Canadian and Newfoundland Governments, the company operates 32 stations in Eastern Canada and Newfoundland and five stations on the Great Lakes. The company also carries on a public telegraph service on 44 steamers. The Canadian Government has passed a law making wireless equipment of passenger vessels compulsory, which will necessarily result in further business for the company. The company has now in hand for the Department of Railways the construction of two high-power stations at Hudson Bay and Le Pas, Manitoba, in connection with the construction of the new Hudson Bay Railroad by the Canadian Government. Under their agreements with the Canadian and Newfoundland Governments the Canadian company's subsidies from these Governments now exceed $100,000 per annum.

Spanish Company (Compania Nacional de Telegrafia sin Hilos—Seven of the first group of stations in Spain and the Canary Islands are in operation. The construction of the stations of the second group has been commenced, the first of which has been completed and opened to service. During the breakdown of the cable between the Canary Islands and Spain the telegraph service was satisfactorily conducted by the Marconi stations. Arrangements are being made for this service to be opened permanently in the course of the next few weeks. Negotiations are pending for wireless telegraph services to be opened with this country and with Italy. The company has obtained orders from the Spanish Government for military stations, and also secured the whole of the orders placed by the Minister of Marine during the last year for the equipment of ships of the Spanish Navy.

Argentine Company (Cia Marconi de Telegrafia sin Hilos del Rio de la Plata).—Besides the change in the capital of the company, to which reference has already been made, there has been an alteration in the directorate and management. Upon the occasion of the visit of the company's representative to Buenos Ayres last year it was found that the Government concession for the erection of a high-power station for external telegraph service was not in a satisfactory form. Subsequent negotiations, however, resulted in a new arrangement being entered into with the Government and the construction of a high-power station has now been commenced. A similar station will be erected in this country, and when completed a direct wireless telegraph service between the Argentine and Europe will be opened.

Marconi Wireless Telegraph Co., of America.—This company has declared a dividend of 2 per cent. for the year ending January 31st, 1913, a satisfactory result having regard to the fact that the contract with the United Wireless Telegraph Co. did not come into force until the month of July of last year, and called for considerable negotiation with shipowners and others to bring about more satisfactory terms upon which the work was in future to be conducted. The full benefit of these improved working conditions was therefore only enjoyed for a comparatively short period of the year. It will also be borne in mind that the increase of capital to the extent of £1,400,000 was for the purpose of providing a network of long-distance telegraph stations and the creation of telegraph services. Time is necessarily required to construct these stations, but this work has proceeded with all possible expedition. It is contemplated that before the end of this year a rapid and reliable telegraph service will be opened between this country and New York. Arrangements will be made to open collecting stations in the City of London and in each of the principal towns in England and Scotland. Similar arrangements have been made in the United States. It is expected that a substantial revenue will accrue from this source. Stations are in course of construction at San Francisco and the Hawaiian Islands, which are approaching completion. It is hoped that before the end of the year we shall see a wireless telegraph service in operation between the United States and Japan, which will then be extended to the Philippine Islands and China.

The contract with the Norwegian Government having been ratified by the Norwegian Storthing, a further trans-Atlantic station will be erected immediately to conduct a telegraph service direct with the North of Europe. Under the terms of the agreement the Norwegian Government will send all telegrams handed in at the telegraph offices for the United States by wireless unless specially routed otherwise by the sender. The company and the Norwegian Government will pool the receipts of their respective stations, which should add a substantial source of revenue to the American company.

Important negotiations are in progress with South American States, which should result in the construction of additional stations in the United States in the early future, and open up direct wireless telegraph service between North and South America.

At all of the stations under construction the new duplex system is being installed, which will provide for a service to be conducted in both directions at the same time. Automatic sending and receiving apparatus is also being supplied, which will enable messages to be transmitted at a speed up to about 100 words per minute in each direction, and this rate of working is likely to be exceeded.

Field Station Department.—During the past year, very considerable progress has been made both in the design and sale of portable wireless telegraph stations for military purposes. Important improvements have been made in the company's apparatus, and to meet the demands of the armies of the world the company has added the following to their standard types of stations:—(1) A 3-KW. station for transport by cart or motor-car; (2) A 1½-KW. station for transport by horses or camels; (3) A ½-KW. cabinet station for use as a permanent station where space is limited.

Highly satisfactory demonstrations of the company's field stations were carried out during the past year in several countries, from which a large business is expected to result. Important orders have been received for field stations apparatus from the British War Office and the Italian, Turkish, Roumanian, Greek and Servian Governments, and the total sales of this class of apparatus have nearly quadrupled in the past year and continue to show substantial increase. The company has made such arrangements as will enable it to give immediate deliveries of all classes of field stations, for which a big demand arises unexpectedly, and prompt deliveries are of all importance.

General Business.—During the past year this company and its subsidiaries have received contracts and executed work for the Governments of the following countries:—Great Britain, Canada, Newfoundland, India, South Africa, Ceylon, Falkland Islands, Trinidad, Italy, Russia, Turkey, Spain, Portugal, Norway, Roumania, Servia, Greece, Montenegro, United States of America, Brazil, Chile, Bolivia, Columbia, Japan and China.

Shareholders have been advised that owing to the delay in submitting to Parliament for ratification the contract entered into with his Majesty's Postmaster-General for the construction of the Imperial stations, and the substantial rise in the cost of materials, the directors gave notice that they no longer considered that contract binding upon them. A new contract has been entered into in which provision is made for any extra cost which may be incurred by reason of the delay in the construction of the stations, and certain alterations and additions have been agreed to. The directors do not believe that the altered conditions will prove of any disadvantage to the company, and having regard to the position which the company holds in the wireless industry, and which position the directors are confident the company will continue to hold, they contemplate that they will construct all the stations required for the Imperial chain. For a long-distance wireless telegraph service a number of the company's recent patents play an essential part, and during the last 12 months the company's scientific adviser, Mr. Guglielmo Marconi, has applied for patents for a number of important inventions and improvements for apparatus used in both transmitting and receiving stations. "Notwithstanding all that has been stated and published in recent times respecting the continuous wave system of wireless telegraphy, experience has not yet proved that that system will be capable of conducting a long-distance wireless telegraph service as efficiently as the slightly damped spark system at present in use. Mr. Marconi has invented what the directors believe to be the simplest and most economical method of generating, transmitting and receiving continuous waves and he alone has been able to transmit messages across the Atlantic by a continuous wave system, of which a satisfactory demonstration, and the only one, was given to the Advisory Committee appointed by the Government. Further tests are being conducted but considerable work and time are required before it will be possible to say with any degree of assurance that any advantage in practical working is to be obtained, either by the continuous wave system alone, or used in conjunction with the spark system. With the ability of the large staff of engineers employed by this company, together with their valuable experience, directed and assisted by Mr. Marconi, the directors are confident that the development of the wireless industry will continue to be pioneered by this company. The high-power station which is being constructed in Carnarvon and which will be worked by the company to conduct a direct service with New York, it is anticipated will be completed and opened for service during the present year. It is being supplied with both the spark and continuous wave systems, which alone will prove from actual experience the comparative merits of the slightly damped wave and the continuous wave in all weathers, under all conditions, every day, week and month of the year. Important negotiations are being conducted with several foreign Governments for the erection of long-distance stations which it is hoped will be brought to a successful issue at an early date.

The successful arrangements made in April, 1912, for placing share capital of the American company have recently been made the subject of legal proceedings by Mr. O. Locker-Lampson, M.P., and Mr. P. E. Wright against the company, the directors and other persons. Within the last few months and shortly before the issue of the writ these gentlemen acquired two and one shares respectively of this company. Mr. Locker-Lampson has since increased his holding by 20 shares. No relief is claimed against the company which is merely joined as a nominal defendant. The apparent object of the proceedings is to impeach the action of the directors and other persons in connection with the above arrangements. The writ was issued so long ago as May 23rd last, but at present Mr. Locker-Lampson and Mr. Wright have not delivered their claim. Beyond this passing reference the directors are advised that would not be proper for them at this stage to make further comment explanation.

The action for the infringement of patents against the National Electric Signalling Co. was heard in New York during the month of June last, in connection with which Mr. Guglielmo Marconi gave lengthy evidence. The Court has not yet delivered its judgment.

W. T. Henley's Telegraph Works Co., Ltd.—The directors have declared an interim dividend on the preference shares at the rate of 4½ per cent. per annum, less income-tax, and on the ordinary shares at the rate of 10 per cent. per annum, free of income-tax, for the half-year ended June 30th last, both payable September 1st.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to—

American Telephone and Telegraph Co.—$34,101,600 convertible 4½ per cent. gold bonds.

Morgan Crucible Co., Ltd.—Seven per cent. non-cumulative preferred ordinary shares of £10 each, £2 10s. paid; and 7 per cent. non-cumulative preferred ordinary shares of £10 each, fully paid.

And to allow the following securities to be quoted in the Official List—

Buenos Ayres and Lacroze Tramways Co.—£500,000 5 per cent. consolidated mortgage debentures, in lieu of the scrip.

Morgan Crucible Co., Ltd.—10,000 7 per cent. non-cumulative preferred ordinary shares of £10 each, fully paid.

South London Electric Supply Corporation, Ltd.—Further issue of £19,095 5 per cent. first mortgage debenture stock.

The Committee has appointed special settling days as under:—

Thursday, August 28th.—Midland Electric Corporation for Power Distribution, Ltd.—Scrip, fully paid, for £400,000 five per cent. first mortgage debenture stock.

And has also ordered the undermentioned securities to be quoted in the Official List:—

Midland Electric Corporation for Power Distribution, Ltd.—Scrip, fully paid, for £400,000 five per cent. first mortgage debenture stock.

Para Electric Railways and Lighting Co., Ltd.—The directors have declared an interim dividend at the rate of 10 per cent. per annum, less income-tax, on the ordinary shares for the half-year ended May 31st, payable September 1st.

Liverpool District Lighting Co., Ltd.—The directors have declared an interim dividend for the half-year to June 30th, at the rate of 4 per cent. per annum, less income-tax.

Oldham, Ashton and Hyde Electric Tramway, Ltd.—The directors have declared an interim dividend at the rate of 5 per cent. per annum, less income-tax, on the ordinary shares for the half-year ended June 30th.

China.—The *Indian Textile Journal* states that during the financial year ended March 31st, 1912, the profit of the Hankow Light and Power Co. was £1,732. The gross receipts for the year under review show an increase of £1,797, or nearly 20 per cent. The working expenses for the year were 38·95 per cent. of the total receipts, as against 50·89 per cent. for the year ending March 31st, 1911, showing a decrease of 11·94 per cent.

National Boiler and General Insurance Co., Ltd.—For the year to June 30th last, the directors propose to dispose of the £26,585 standing to the credit of profit and loss account as follows:—Dividend at the rate of 7s. per share for the half-year ended June 30th, 1913, £3,250; bonus of 3s. per share, £2,250; to current risk and reserve fund, £10,000; writing off depreciation of investments, £2,311, and carrying forward £6,774.

Ontario Power Co., of Niagara Falls.—In their report for the year 1912 the directors state, says the *Financial News*, that the growth of the business during the past year shows a very marked increase over the previous year. For 1912 the total receipts were $1,255,955.38, net income $1,014,376.69, interest $648,935.92, surplus $365,440.77. The company has 10 generators installed, with a rated capacity of 117,000 H.P. The two additional generators and turbines would give a total capacity of 143,000 H.P. Units Nos. 13 and 14, of 13,000 H.P. each, had been ordered. The company had the right to put in a third conduit, 18 ft. in diameter, which would furnish water for the development of approximately 70,000 additional H.P. As the earnings increased so rapidly during the last of the half-year, the directors felt justified in declaring in November an initial dividend of 1¼ per cent.

Continental.—Belgium.—La Société Technique de la Force Motrice is the name of a new company which has just been formed in Liége (17 Rue des Guilleonins) with a capital of £50,000, to acquire and exploit certain patents in connection with the use of electricity for power purposes.

Aberdeen Suburban Tramways Co.—The directors report that the profit earned during the half-year amounted to £1,595, and there is a balance of £3,792 at the credit of profit and loss account. The directors recommend that £2,000 be added to the credit of the renewal and depreciation account; a dividend at the rate of 2½ per cent. for the past year, £780; directors' fees, £42; leaving to be carried forward, £969. According to the *Financier* the directors have had under consideration the question of extending the company's operations by the working of trackless tramway cars or other mechanically-propelled vehicles, and they are satisfied that the working of such vehicles would not only be profitable in itself, but would be profitable as a means of attracting fresh traffic to the company's undertaking.

STOCKS AND SHARES.

Tuesday Evening.

Advantage is generally taken of this season of the year to look back over the progress made by the prices of stocks and shares throughout the current year. General business as a rule is very quiet; and since it is quite likely that few people bother themselves about Stock Exchange prices in the holiday time, this seems to be a more convenient time to institute the comparisons than the end of June. Consequently, we set out upon our regular market pilgrimage, drawing representative examples from the various sections and tabulating the results in the ordinary way.

Prices in most cases have moved in the direction contrary to that in which proprietors of stocks and shares would prefer to see them go. For this the three principal reasons are:—The Balkans war, the tightness of money, and the general trade prosperity—with a host of minor factors swinging upon the main considerations. The revolution in Mexico is another important influence in several of the markets with which these notes especially deal.

The Electric Lighting Market has spent a quiet and uneventful eight months. Prices have dipped to some extent, but just lately have shown a reviving tendency in consequence of satisfactory dividend announcements. We take the ordinary shares of a few well-known companies, and the comparisons come out as follows:—

	Dec. 31, 1912.	Aug. 19, 1913.	Rise or fall.
Brompton and Kensington	9	8⅞ xd	— ⅛
Charing Cross	4⅞	4⅝ xd	— ¼
Chelsea	4⅜	4¾	+ ⅜
City of London	17	16⅞	— 1¼
County of London	11⅜	11¼	— ⅛
Kensington and Knightsbridge	7⅝	7⅜ xd	— ¼
Metropolitan	8⅜	8⅛ xd	— ¼
St. James's and Pall Mall	9⅝	8⅜	— 1¼
Westminster	9	8¼ xd	— ¾

The effect of the Mexican Revolution comes out clearly in the fall which has taken place in Mexican Light and Power issues and Monterey bonds. The market in these Colonial and Foreign Electricity and Supply descriptions has been dull all the way through. Stocks and bonds connected with the utility companies of the Western Hemisphere have given way substantially, and a brief selection of the Traction securities may be added to that of the Supply division:—

	Dec. 31, 1912.	Aug. 19, 1913.	Rise or fall.
Mexican Light and Power, Common	85	70	— 15
do. 7 % Cum. Pref.	104½	98½	— 6
Monterey Railway Light and Power 5 per cent. First Mort. Deb.	87½	77½	— 10
Montreal Light, Heat and Power	229½	220	— 9½
Northern Light, Power and Coal 5 per cent. First Mort. Bonds	27½	20	— 7½
Shawinigan Water, Capital	145	136½	— 8½
Anglo-Argentine Tramways First Pref.	4⅞	4⅛	— ¾
Brazilian Traction, Light and Power	94½	95	+ ½
British Columbia Electric Railway Def.	141½	127½	— 14
Calcutta Trams Ord.	5⅞	6	+ ⅛
Mexico Trams, Common	112	98xd	— 14
do. Gen. Con. 5 per cent. Bonds	104	101	— 3
Para Electric Railways and Light Ord.	7½	6½	— 1
Rio Trams First Mort.	103	102½	— ½

Coming to Home Railways, it will be noticed that there are material falls in the Undergrounds, though a fair part of the drop has recently been recovered. Within the past week or two the market for Home Railway stocks has developed a much better tone, but the fear of labour difficulties lays a restraining hand upon the enterprise of a good many people who might otherwise be tempted to embark money in such stocks. So far as the Undergrounds are concerned, the suggested appointment of a Traffic Board for London led to a little dullness in the prices at first, this, however, being subsequently compensated by a recovery:—

	Dec. 31st, 1912.	Aug. 19th, 1913.	Rise or fall.
British Elec. Trac. 6 per cent. Pref.	12½	9	— 3½
" " Deferred	6	5	— 1
Central London Railway, Ordinary	83	74	— 9
" " Deferred	83	76	— 7
London United Trams, 4 per cent. Deb.	70½	62	— 8½
Metropolitan Consol.	53¼	47½	— 5¾
Metropolitan District	40½	34½	— 6
Underground Electric Railways	4⅛	4	— ⅛
" " " "A"	8⅛	7⅞	— ⅛

The Telegraph market has pursued the tenour of its usual even way. Most of its stocks have been subject to the influences operating against, or in favour of, investment securities as a whole. There have been violent movements in Marconi shares, but within the last week a material rally occurred upon the publication of the company's report in respect of 1912-13. Reuters gave way sharply during the period under review, but in their case, too, there has been some recovery. To the Telegraph list we add a brief catalogue of movements in the manufacturing section—it will be noticed that the principal alteration is a good rise in the price of India-rubber shares:—

	Dec. 31st, 1912.	Aug. 19th, 1913.	Rise or fall.
Anglo-American Telegraph Deferred	26	23¾	— 2¼
Eastern Telegraph Ordinary stock	134½	128½	— 6
Eastern Extension	13¼	12¾	— ½
Great Northern Telegraph	28⅝	31	+ 2⅜
Marconi's Wireless Telegraph	4⅝	4¼	— ⅜
Reuters	10⅝	10	— ⅝
United River Plate Telephone	7⅞	6¾	— 1⅛
West India and Panama Telegraph	3⅛	2⅞	— ¼
Do. First Pref.	10⅝	9¾	— ⅞
Western Telegraph, Ltd.	13¼	13	— ¼
Babcock & Wilcox	8⅞	8⅞	—
Brush 4½ % Second Debenture	30	25	— 5
Callender's Cable	10⅞	11¼	+ ⅜
Castner-Kellner	8⅛	8½	+ ⅜
Edison & Swan "A"	½	½	— 1/16
Henley's Ordinary	12⅝	12¾	+ ⅛
India-Rubber	10	13¼	+ 3¼
Telegraph Construction	35½	37	+ 1½

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Aug. 19th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bournemouth & Poole, Ord. ..	10	5½	6	9¼ — 10¼ xd	..	5 17 1
Do. 4½ % Pref.	10	4½	4½	8¾ — 9½ xd	..	4 14 9
Do. Second 6 % Pref. ..	10	6	6	9⅞ — 10⅜ xd	..	5 15 8
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 10
Brompton & Kensington, Ord...	5	10	10	8½ — 8⅞ xd	..	5 14 3
Do. 7 % Cum. Pref.	5	7	7	8½ — 8⅝ xd	..	4 1 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	94 — 97	..	4 2 6
Charing Cross, West End & City	5	5	5†	4⅜ — 4⅞ xd	+ ⅛	5 2 7
Do. 4½ % Cum. Pref.	5	4½	4½	4½ — 4⅝ xd	..	4 17 3
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3½ — 4	..	5 12 6
Do. Do. 4 % Deb... ..	100	4	4	90 — 92	..	4 7 0
Chelsea, Ord.	5	5	4†	4⅜ — 5⅛	..	4 17 7
Do. 4½ % Deb.	Stock	4½	4½	94 — 97	..	4 12 9
City of London, Ord.	10	8	9	15 — 16½	..	5 9 1
Do. 6 % Cum. Pref.	10	6	6	12 — 13	..	4 12 4
Do. 5 % Deb.	Stock	5	5	114 —118	..	4 4 9
Do. 4½ % Second Deb. ..	100	4½	4½	99 —101	+1	4 9 1
County of London, Ord... ..	10	6	6	11 — 11½	..	5 4 4
Do. 6 % Pref.	10	6	6	11½ — 12	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	102½ —104½	..	4 6 2
Do. 4½ % Second Deb. ..	Stock	4½	4½	98 —101	..	4 9 1
Edmundson's, Ord.	£8	Nil	..	3 — 3	..	Nil
Do. 6 % Cum. Pref.	5	Nil	6	4 — 4⅛	..	3 8 7
Do. 6% Non-Cum. Pref. ..	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	79 — 82	..	5 9 9
Folkestone	5	6	6	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4½ — 5	..	5 0 0
Do. 4½ % First Deb.	100	4½	4½	88 — 90	..	5 0 0
Hove	5	9	9†	7¾ — 8¼	..	5 9 1
Kensington & Knightsbridge, Ord	5	9	8†	7⅛ — 7⅝ xd	+ 1/16	5 18 0
Do. 4 % Deb.	Stock	4	4	88 — 91	..	4 7 11
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	74 — 78	..	5 15 5
London Electric, Ord.	3	2½	2½	1½ — 1⅝	..	4 7 9
Do. 6 % Pref.	5	6	6	4⅞ — 5¼	+ ⅛	5 14 3
Do. 4 % First Mort. Deb. ..	Stock	4	4	88 — 91	..	4 8 0
Metropolitan	5	4	4†	3½ — 3⅝ xd	..	5 10 4
Do. 4½ % Cum. Pref.	5	4½	4½	4½ — 4⅝	..	5 0 0
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	96 — 99	..	4 10 1
Do. 3½ % Mort. Deb.	Stock	3½	3½	77 — 80	..	4 7 6
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 0
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9½ — 10½	..	5 14 3
Oxford	5	7½	8†	6 — 6½	+ ⅛	5 11 6
St. James' and Pall Mall, Ord.	5	10	10†	8⅜ — 8⅝	+ ⅛	5 12 8
Do. 7 % Pref.	5	7	7	6⅝ — 7	..	5 0 0
Do. 3½ % Deb.	100	3½	3½	82½ — 85½	..	4 1 10
South London, Ord.	4	5	5½	2⅜ — 3⅝	..	7 0 9
Do. 5 % First Mort. Deb. ..	100	5	5	96 — 99	..	5 1 0
South Metropolitan, 7 % Pref...	1	7	7	1⅛ — 1⅜	..	5 17 11
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99	..	4 10 6
Urban, Ord...	£8	Nil	Nil	⅛ — ¼	..	..
Do. 5 % Cum. Pref.	5	2	3	2⅜ — 2¾	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	85 — 88	..	5 2 3
Westminster, Ord.	5	10	10	8 — 8⅛ xd	..	5 17 8
Do. 4½ % Cum. Pref... ..	5	4½	4½	4⅞ — 5⅛	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5 — 5⅛	..	5 14 8
Calcutta, Ord.	6	8½	8½	7 — 7⅛	..	5 13 4
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 8
Calgary Power, 1st Mort. Bds.	100	5	5	90½ — 92½	+ ½	5 8 1
Canadian Gen. El. Com. ..	$100	7	7	108 —112	..	6 5 0
Do. 7 % Pref.	$100	7	7	119 —124	..	5 12 11
Cordoba Lt., Power and T., Ord.	1	3	5	3/8 — 13/16	..	6 8 1
Do. 5 % Deb.	100	5	5	93½ — 95½	..	5 4 9
Elec. Lt. and P. of Cochabamba, 8 % Bonds	100	6	6	90 — 92	..	6 10 5
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	87½ — 90½	..	5 10 6
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	91½ — 93½	..	5 6 11
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	3/16 — 5/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	9 12 0
Kaministiquia Power, 5% G. Bs.	$500	5	5	101 —103	..	4 17 1
Madras, Ord.	5	Nil	..	1¼ — 1⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	103 —106	..	4 14 4
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	78 — 82	+4½	6 1 11
Mexican Lt. & Power, Common	$100	4	4†	68 — 72	+7	5 11 1
Do. 7 % Cum. Pref.	$100	7	7	96 —101	+3	6 18 7
Do. 5 % 1st Mort. Gold Bds.	..	5	5	90 — 93	+4½	5 8 8
Do. 5 % 2nd Mort. Bonds ..	100	5	5	80 — 82	+5½	6 1 11
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	76 — 79	..	6 6 7
Montreal, Lt., H. and Power ..	$100	8	9†	215 —225	+ 8	4 0 0
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	15 — 25	..	..
River Plate, Ord.	Stock	10	10	207 —217	..	4 8 0
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	102 —107	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	97½ — 99½	..	4 19 6
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 3
Shawinigan Water, Capital ..	$100	5	5½	134 —139	+8½	3 19 2
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	104½ —106½	..	4 14 0
Do. 4½ % Per. Deb.	Stock	4½	4½	99¼ —102½	..	4 7 10
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	97 —100	..	4 10 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Victoria Falls Power, Pref. ..	1	11¼d.	17½d.	11/16 — 13/16	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106 —108	..	5 11 1

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	6⅞ — 7⅛	..	6 2 0
Do. 5 % Deb. Red.	Stock	5	5	93½ — 96⅞	..	5 4 9
American Telep. & Teleg., Cap.	$100	8	8	132 —135	+1½	5 18 6
Do. Collat. Trust	$1000	4	4	90¾ — 92¼	..	4 6 6
Anglo-American Telegraph ..	Stock	3	3	62 — 65	+ 2	4 12 4
Do. 6 % Pref.	Do.	6	6	108 —109	..	5 10 1
Do. Def.	Do.	30/-	30/-	23½ — 24	+ ⅜	6 5 0
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	104 —106	..	4 15 8
Chili Telephone	5	7	8	7⅞ — 7⅞	..	5 5 10
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	82½ — 84½	..	4 14 8
Cuba Telegraph	10	6	6	8¾ — 9¼	..	6 6 4
Do. 10 % Pref.	10	10	10	15½ — 16⅝	..	5 19 4
Direct Spanish Telegraph, Ord.	5	4	4†	8¼ — 8⅝	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6¾ — 7¼	..	6 12 0
Direct United States Cable ..	10	5	4	6½ — 7¼	..	5 10 4
Direct W. India Cable, 4½ % Red. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	127 —130	..	5 7 8
Do. 3½ % Pref. Stock.. ..	Do.	3½	3½	75½ — 77½	..	4 10 4
Do. 4 % Mort. Deb.	Do.	4	4	94½ — 96½	..	4 2 11
Eastern Extension	10	7	7	12½ — 13	+ ⅛	5 7 8
Do. 4 % Deb.	Stock	4	4	92 — 94	..	4 5 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	95	4	4	99 —101	..	3 19 3
Globe Telegraph and Trust ..	10	6	6†	11 — 11½	+ ½	5 4 4
Do. 6 % Pref.	10	6	6	12 — 12½	..	4 16 0
Great Northern Telegraph ..	10	18	20	30 — 32	..	6 13 0
Indo-European Telegraph ..	25	13	13	55½ — 57½	+ ½	5 13 1
Mackay Companies Common ..	$100	5	5	82 — 84	..	5 19 1
Do. 4 % Cum. Pref.	$100	4	4	66 — 70	..	5 14 4
Marconi's Wireless Telegraph	1	20	..	4⅜ — 4⅝	+ 1/16	2 12 10
Do. 7% Cum. Partic. Pref.	1	17	..	8⅛ — 8¼	+ ⅛	4 10 8
Monte Video Telephone, Ord. ..	1	6	6†	1 — 1⅛	..	5 6 8
Do. 5 % Pref.	1	5	5	2/16 — 4/16	..	5 14 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	99½ —100½	+ ⅛	4 9 4
Oriental Telep. and Elec. ..	1	8	10	1⅜ — 1⅝	..	5 8 6
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅛	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	86½ — 88½	..	4 10 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	96 — 98	..	4 1 8
Reuter's	10	10	10	9¾ — 10½	+ ¼	9 17 6
Submarine Cables Trust	Cert.	6	6	124 —127	..	4 14 6
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	95 — 97	..	4 12 9
United River Plate Telephone	5	8	8†	6¾ — 7	..	5 14 4
Do. 5 % Cum. Pref.	5	5	5	5 — 5¼	..	4 11 0
West Coast of America	2½	2½	..	1/16 — 1/16	..	4 3 4
Do. 4 % Debs., 1 to 500 guar. by Bras. Sub. Tel.	100	4	4	93 — 96	..	4 1 8
West India and Panama Teleg.	10	1½	1½	2⅜ — 3	+ 1/16	4 3 4
Do. 6 % Cum. 1st Pref. ..	10	6	6	9⅜ — 10½	..	5 18 5
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9⅜ — 9¾	..	6 1 6
Do. 5 % Debs.	100	5	5	99 —101	..	4 19 0
Western Telegraph, Ltd. ..	10	7	7†	12⅜ — 13½	..	5 5 8
Do. 4 % Deb.	Stock	4	4	90½ — 92½	..	4 6 6
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	93 — 95	+2	4 14 9

* Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. 8s. in Funded Dividend Certs.

CONTINUED ON NEXT PAGE

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Aug. 19th.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	$\frac{3}{16}$ — $\frac{5}{16}$	..	Nil
Do. 5 % Pref.	1	5	5	$\frac{29}{32}$ — $\frac{31}{32}$	..	6 8 0
Do. 4½ % Deb.	100	4½	4½	72 — 77	..	5 17 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	8 — 10	+ ½	..
Do. Do. Deferred	100	..	..	4 — 6	+ ½	..
Do. Do. 6 % Cum. Pr'f	100	6	6	80 — 83	+2	7 4 7
Do. 7 % Non-Cum. Pr'f.	100	..	3	43 — 46	+5	6 10 5
Do. 5 % Perp. Deb.	100	5	5	90 — 93	..	5 7 6
Do. 4½ % 2nd Deb.	100	4½	4½	72 — 76	..	5 18 5
Central London Railway, Ord.	100	3	3	73 — 75	..	4 0 0
Do. Gtd. Assented	100	..	..	81 — 83	..	4 16 5
Do. Pref.	100	4	4	73 — 80	..	5 0 0
Do. Gtd. Assented	100	..	..	82 — 84	..	4 15 3
Do. Def.	100	2	2	75 — 77	..	2 12 0
Do. Gtd. Assented	100	..	..	80 — 82	+1	4 17 7
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	98 —100	..	5 0 0
Do. Do. 1896	100	5	5	98 —100	..	5 0 0
Do. Do. 1901	100	5	5	97 — 99	..	5 1 0
Do. Do. 1908	100	5	5	97 — 99	..	5 1 9
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Great Northern & City, Pr'f. Ord	10	Nil	Nil	$2\frac{1}{8}$ — $2\frac{3}{8}$	..	Nil
Hastings Trams, 6 % Pref.	1	6	6†	$\frac{15}{16}$ — $\frac{31}{32}$	..	7 13 7
Do. 4½ % Deb.	100	4½	4½	68 — 73	..	6 3 3
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	$2\frac{5}{8}$ — $2\frac{7}{8}$	..	4 15 3
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	76 — 78	..	6 8 2
London and Suburban, Ord.	1	..	..	$\frac{3}{32}$ — $\frac{5}{32}$	..	..
Do. Do. 5 % Cum. Pref.	1	..	..	$\frac{7}{16}$ — $\frac{13}{16}$	..	..
Do. Do. 4½ % 1st. Deb.	100	..	4½	65 — 75	..	6 0 0
London Elec. Railw'ys, 4 % Deb.	100		4	91 — 93	..	4 6 0
London United Trams, 4 % Deb.	100	4	4	60 — 64	..	6 5 0
Metropolitan Railway Consol.	100	1½	1½	$47\frac{1}{2}$ — $47\frac{3}{4}$	— $\frac{3}{4}$	3 8 5
Do. Surplus Lands	100	2½	2½	60 — 62	+1	4 8 9
Do. 3½ % Deb.	100	3½	3½	83 — 85 xd	..	4 2 4
Do. 3½ % Pref.	100	3½	3½	81 — 83 xd	..	4 4 4
Do. 3½ % Con. Pref.	100	3½	3½	77 — 79 xd	..	4 8 7
Metropolitan District Ord.	100	Nil	Nil	34½ — 35	— ½	Nil
Do. 6 % Deb.	100	6	6	136 —139	..	4 6 4
Do. 4 % Deb.	100	4	4	92 — 94	..	4 5 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	82 — 84	+1	5 7 2
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	84 — 88	..	5 2 3
Do. 5 % Deb.	100	5	5	90 — 93	—1	5 7 6
Potteries, Ord.	1	3½	3½	$\frac{3}{32}$ — $\frac{13}{32}$	..	..
Do. 5 % Pref.	1	5	5	$\frac{29}{32}$ — $\frac{31}{32}$ xd	..	7 12 5
Do. 4½ % Deb.	100	4	4½	82 — 85	..	5 5 0
South Metro. Trams, 6 % Pref.	1	..	..	$\frac{5}{8}$ — $\frac{3}{4}$	..	8 0 0
Do. 4 % Deb.	100	..	4	63 — 68	..	5 17 8
Underground Elec. Railways	10	..	..	8⅝ — 4½	+ ⅛	Nil
Do. "A"	1/-	4½	..	$\frac{1}{2}$ — $\frac{5}{8}$	..	Nil
Do. 6% First Cum. Inc. Deb.	100	1½	6	111 —113	..	5 6 2
Do. 4½ % Bonds	100	Nil	4½	99 —101	..	4 9 1
Do. 5 % Income	100	3	6 †	93⅛ — 94½	— ½	6 7 0
Yorkshire (West Riding), Ord.	5	..	..	$\frac{1}{16}$ — $\frac{3}{16}$	— $\frac{1}{16}$	Nil
Do. 5 % Pref.	5	..	3½	3¾ — 4	..	..
Do. 4½ % Deb.	100	4½	4½	81 — 85	..	5 6 0

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	$4\frac{11}{16}$ — $4\frac{13}{16}$	..	5 11 4
Do. 2nd Pref.	5	5½	5½	$4\frac{3}{8}$ — $4\frac{5}{8}$	+ $\frac{1}{16}$	5 18 11
Do. 4 % Deb.	100	4	4	91 — 93	..	4 6 0
Do. 4½ % Deb.	100	4½	4½	95 — 97	+ ½	4 12 9
Do. 5 % Deb.	100	5	5	97½ — 99½	+ ½	5 0 6
Auckland Trams, 5 % Deb.	100	5	5	100 —102	..	4 18 0
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11½	..	5 4 4
Do. 4½ % Deb.	100	4½	4½	94 — 96	..	4 13 9
Do. 5 % 2nd Deb.	100	5	5	96 — 99	..	5 1 0
Brazilian Traction Light and Power	$100	..	6†	94 — 96	+1½	6 5 0
Brisbane Trams Invt., Ord.	5	8	8	6⅞ — 7⅜	..	5 8 6
Do. 5 % Pref.	5	5	5	$4\frac{3}{8}$ — $5\frac{1}{8}$	..	4 8 11
Do. 4½ % Deb.	100	4½	4½	97 —100	..	4 10 0
B. Columbia Elec. Rly., Def.	100	8	8†	125 —130	+1	6 3 1
Do. Pref. Ord.	100	6	6	110 —115	+1	5 4 4
Do. 5 % Pref.	100	5	5	102½ —105½	..	4 14 9
Do. 4½ % 1st Mort. Deb.	40	4½	4½	100 —103	..	4 7 5
Do. 4½ % Vancouver Deb.	100	4½	4½	100 —102	..	4 8 3
Do. 4½ % Con. Deb.	100	4½	4½	95⅞ — 97½	..	4 7 2
Calcutta Trams, Ord.	5	7	6†	5⅞ — 6⅛	..	5 12 0
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. 4½ % Deb.	100	4½	4½	95½ — 98½	..	4 11 5
Cape Electric Trams	1	2½	5	$\frac{11}{16}$ — $\frac{13}{16}$	..	6 8 1
City Buenos Aires Trams (1904)	5	5	5†	5⅝ — 5⅞ xd	+ ⅛	4 9 11
Do. 4 % Deb.	100	4	4	92 — 97	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	90½ — 94½	..	5 5 10
Havana Elec. Rly., 5 % Bonds	$1000	5	5	94½ — 98½	..	5 1 6
Kalgoorlie Elec. Trams	1	Nil	..	$\frac{7}{16}$ — $\frac{9}{16}$	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	..	5 11 1
Do. 6 % B Deb.	100	6	8	25 — 85	..	..
La Plata Elec. Trms, Ord.	1	Nil	..	$\frac{13}{32}$ — $\frac{17}{32}$	..	..
Do. Pref.	1	6	..	$\frac{29}{32}$ — $1\frac{1}{32}$	..	5 16 6
Lisbon Elec. Trams, Ord.	1	6	4½d.	$1\frac{3}{32}$ — $1\frac{11}{32}$	..	4 9 8
Do. 6 % Pref.	1	6	6	1 — 1½	..	4 16 0
Do. 5 % Deb.	100	5	5	91 — 96	..	5 4 2
Madras Elec. Tr. 6% Cum. Pref.	5	..	6	4⅜ — 5⅛	..	5 17 1
,, Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 1
Manaos Trams & Lt., 1st Deb.	100	5	5	87 — 89	+ ½	5 12 4
Manila Elec. R. and Ltg., Bonds	$1000	5	5	97 — 99 xd	..	5 1 0
Mexico Trams Com.	$100	7	7†	100 —102	+4½	6 17 3
Do. Gen. Con. 5 % Bonds	..	5	5	98½ — 95½	+5	5 4 9
Do. 6 % Bonds	100	6	6	93 — 95	+5½	6 6 4
Para Elec. Rlys. & Lt., Ord.	5	10	10	6½ — 6⅝	+ ⅛	7 8 2
Do. 6 % Pref.	5	6	6	4⅝ — 5⅜	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	98½ —100½	..	4 19 6
Perth (W.A.) Elec. Tr., Ord.	1	5	5½	1⅛ — 1⅜	..	4 0 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	101½ — 103½	+1½	4 16 7
Do. 5 % Mort. Bonds	100	5	5	95½ — 97½	+ ½	5 2 7
Sao Paulo Tram, Lt. and P. 5 % 1st Deb.	$500	5	5	101 — 103	..	4 17 1
Singapore Trams, 5 % Deb.	100	5	5	85 — 89	..	5 12 4
Southern El. Tr. B.A., 5 % Deb.	100	5	5	94½ — 96½	..	5 3 8
Un. Elec. Trams Monte Video	5	7	7	4½ — 5	..	7 0 0
Do. 6 % Pref.	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 5 % 1st Deb.	100	5	5	97 —100	..	5 0 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	100 —102	..	4 8 3

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	$\frac{29}{32}$ — $1\frac{3}{32}$	..	7 7 8
Do. 6 % Pref.	1	6	6	$\frac{31}{32}$ — $1\frac{1}{32}$	..	7 2 6
Babcock & Wilcox	1	28	16	$3\frac{1}{4}$ — $3\frac{1}{2}$	+ ⅛	4 18 6
Do. Pref.	1	6	6	$1\frac{1}{4}$ — $1\frac{3}{8}$	..	4 7 3
British Aluminium, Ord.	1	Nil	..	$1\frac{1}{16}$ — $1\frac{1}{8}$	+ $\frac{1}{16}$	..
Do. 6 % Cum. Pref.	1	Nil	6	$\frac{7}{8}$ — $\frac{15}{16}$	..	5 17 2
Do. 5 % Prior Lien Debs.	100	5	5	91 — 94	..	5 4 2
Do. Deb. Stk.	100	5	5	82 — 85	..	5 17 8
B.I. & Helsby Cables	5	10	10	7⅜ — 8	..	6 5 0
Do. Pref.	5	6	6	5⅞ — 6¼	..	4 16 0
Do. Deb.	100	4½	4½	99 —102	..	4 8 3
British Thomson-Houston, Deb.	100	4½	4½	95 — 98	..	4 11 10
British Westinghouse, Pref.	8	Nil	Nil	$\frac{3}{4}$ — 1	+ ⅛	Nil
Do. Deb.	100	4	4	63 — 67	+1	5 19 5
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- — 3/-	..	Nil
Do. Pref.	1	..	..	4/6 — 5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ½	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	70½ — 75½	..	6 12 5
Do. 4½ % Deb	100	4½	4½	38 — 43	..	10 9 4
Do. 4½ % Second Deb.	100	4½	4½	23 — 27	..	16 13 4
Callender's Cable	5	15	15	10⅞ — 11½	+ ⅛	6 10 5
Do. Pref.	5	5	5	$4\frac{13}{16}$ — $5\frac{1}{16}$	..	4 18 9
Do. Deb.	100	4½	4½	96 — 99	..	4 10 6
Castner-Kellner	1	20	20	$8\frac{1}{16}$ — $8\frac{3}{16}$	..	5 4 11
Do. Deb.	100	4½	4½	102 —105 xd	..	4 5 9
Crompton & Co., Deb.	100	5	5	54½ — 59½	..	8 8 0
Dick, Kerr	1	5	Nil	$\frac{15}{16}$ — $1\frac{1}{16}$	..	..
Do. Pref.	1	6	6	$\frac{31}{32}$ — $1\frac{3}{32}$	..	7 18 10
Edison & Swan, A, £8 paid	5	Nil	..	0 — $\frac{1}{16}$	..	Nil
Do. fully paid	5	Nil	..	$1\frac{1}{16}$ — $1\frac{1}{8}$	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	65 — 70	..	7 2 10
Electric Construction	2	3½	5	1 — 1½	..	8 0 0
Do. Pref.	2	7	7	$1\frac{13}{16}$ — $2\frac{1}{16}$	..	6 15 9
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8	..	8 5 8
Do. Deb.	100	5	6	92 — 94	..	5 4 2
General Electric, 6% Pref.	10	5	6	9½ — 10½	..	5 14 3
Do. Deb.	100	4	4	89 — 94	..	4 5 1
Henley's, Ord.	5	15	15	12½ — 13½	+ ½	5 13 2
Do. Pref.	5	4½	4½	4⅝ — 5	..	4 10 0
Do. Deb.	100	4½	4½	100 —102	..	4 8 3
India-Rubber, G. & T.	10	..	7½	12⅜ — 13⅜	..	5 9 1
Do. Pref.	10	5	5	9 — 10	..	5 0 0
Telegraph Construction	12	17½	20	36 — 38	+1	6 3 10
Do. Deb.	100	4	4	95 — 97	..	4 2 6
Willans & Robinson	1	Nil	..	$\frac{1}{16}$ — $\frac{3}{16}$	..	Nil
Do. Pref.	5	Nil	..	$\frac{1}{2}$ — $\frac{3}{4}$	..	Nil
Do. Deb.	100	4	4	55 — 57	..	7 0 4

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 4½ per cent., April 17th, 1913.

AMERICAN EXPORTS OF ELECTRICAL GOODS.

The following figures, showing the exports of electrical goods from the United States during the year ended June, 1912, are taken from the recently-issued official trade statistics; where possible, figures for 1910-11 have been added for purposes of comparison, and notes of any increases or decreases given :—

	1911-12. Dollars.		1911-12. Dollars.
*Telegraph instruments.**—			
To Canada	17,000	To Other countries ...	18,000
„ Central America ...	9,000		
„ Mexico	13,000	Total ...	68,000
„ Argentina ...	11,000		
*Telephone instruments.**—		*Other electrical instruments and appliances.**—	
To United Kingdom ...	56,000	To Canada	3,102,000
„ Canada	582,000	„ Mexico	926,000
„ Central America ...	17,000	„ Central America ...	286,000
„ Mexico	24,000	„ Cuba	504,000
„ Cuba	107,000	„ Argentina ...	414,000
„ Brazil	59,000	„ Brazil	2,296,000
„ other S. America ...	20,000	„ Japan	508,000
„ Japan	21,000	„ Philippine Islands	349,000
„ Australia	53,000	„ Australia	184,000
„ Other countries ...	35,000	„ United Kingdom ...	828,000
Total ...	974,000	„ Other countries ...	1,283,000
		Total ...	10,682,000

	1910-11. Dollars.	1911-12. Dollars.	*Inc. or dec.* Dollars.
Electrical machinery.—			
To Canada	1,665,000	1,870,000	+ 205,000
„ United Kingdom ...	580,000	883,000	+ 303,000
„ Mexico	1,350,000	950,000	— 400,000
„ Central America ...	138,000	136,000	— 2,000
„ Cuba	185,000	346,000	+ 161,000
„ Argentina	187,000	153,000	— 34,000
„ Brazil	484,000	996,000	+ 512,000
„ British India	126,000	147,000	+ 21,000
„ Japan	1,307,000	941,000	— 366,000
„ Australia	383,000	534,000	+ 151,000
„ Philippine Islands ...	151,000	117,000	— 34,000
„ South Africa	269,000	134,000	— 135,000
„ Other countries ...	1,198,000	1,238,000	+ 40,000
Total ...	8,025,000	8,445,000	+ 420,000

	1911-12. Dollars.		1911-12. Dollars.
Gas engines, stationary.†—			
To Canada	131,000	To Other countries ...	94,000
„ Argentina ...	74,000		
„ Australia	38,000	Total ...	394,000
„ Europe	57,000		
Petrol engines, stationary.†—		*Steam engines, stationary.*†—	
To Canada	755,000	To Canada	248,000
„ Argentina ...	397,000	„ Cuba	90,000
„ Australia	307,000	„ Mexico	61,000
„ Mexico	43,000	„ Brazil	42,000
„ United Kingdom ...	98,000	„ Philippine Islands	22,000
„ Other countries ...	863,000	„ Other countries ...	288,000
Total ...	2,463,000	Total ...	751,000

* Not shown separately in 1910-11; the total exports of "electrical instruments and appliances (including telegraph and telephone instruments)" in that year were valued at $10,703,000.

† Not shown separately in 1910-11; the total exports of "steam and other power engines and parts thereof, stationary," in that year were valued at $4,043,000.

Australian Electric Heating Apparatus.—According to the *Mining and Engineering Review*, the C. and C. Electric Heating Syndicate, of Melbourne, is being formed into a company, with a capital of £150,000, to take over the patents and enter on the manufacture of electrical apparatus, such as cooking stoves, hot plates, soldering irons, kettles, &c. "The experiments already carried out by the syndicate show that a very durable heating element has been evolved. The patentees claim that it possesses considerable advantages over any other element on the market, and can be produced at a low cost."

Barcelona Exhibition.—The project for holding an International Electrical Exhibition at Barcelona in 1915 has been officially approved by the Government.

GERMAN EXPORTS FOR THE HALF-YEAR.

The following table shows the exports of electrical goods from Germany during the half-year just closed; figures for the first half-year of 1912 are added for purposes of comparison, and notes of any increases or decreases are given :—

	1912. Kilogs.	1913. Kilogs.	*Inc. or dec.* Kilogs.
Dynamos, electric motors, transformers, &c., weighing up to 25 kg.—			
To Great Britain	26,000	31,000	+ 5,000
„ Austria	48,000	57,000	+ 9,000
„ Russia	39,000	99,000	+ 60,000
„ Other countries ...	136,000	187,000	+ 51,000
Total ...	249,000	374,000	+ 125,000
Ditto, weighing from 25 kg. to 100 kg.—			
To France	100,000	100,000	—
„ Great Britain	100,000	147,000	+ 47,000
„ Holland	89,000	112,000	+ 23,000
„ Austria	302,000	266,000	— 36,000
„ Russia	113,000	217,000	+ 104,000
„ Spain	70,000	97,000	+ 27,000
„ Other countries ...	570,000	548,000	— 22,000
Total ...	1,344,000	1,487,000	+ 143,000
Ditto, weighing from 100 kg. to 500 kg.—			
To Belgium	289,000	310,000	+ 21,000
„ France	152,000	156,000	+ 4,000
„ Great Britain	200,000	357,000	+ 157,000
„ Italy	222,000	194,000	— 28,000
„ Holland	210,000	251,000	+ 41,000
„ Austria	423,000	279,000	— 144,000
„ Russia	224,000	391,000	+ 167,000
„ Spain	179,000	274,000	+ 95,000
„ Brazil	248,000	286,000	+ 38,000
„ Argentina	216,000	189,000	— 27,000
„ Other countries ...	800,000	996,000	+ 196,000
Total ...	3,163,000	3,683,000	+ 520,000
Ditto, weighing over 500 kg.—			
To Belgium	813,000	1,133,000	+ 320,000
„ France	270,000	542,000	+ 272,000
„ Great Britain	268,000	640,000	+ 372,000
„ Italy	1,321,000	863,000	— 458,000
„ Spain	858,000	1,270,000	+ 412,000
„ British South Africa	586,000	625,000	+ 39,000
„ Japan	1,536,000	1,204,000	— 332,000
„ Argentina	1,417,000	831,000	— 586,000
„ Brazil	500,000	610,000	+ 110,000
„ Norway	529,000	412,000	— 117,000
„ Russia	524,000	832,000	+ 308,000
„ Holland	580,000	530,000	— 50,000
„ Other countries ...	1,860,000	2,737,000	+ 877,000
Total ...	11,062,000	12,229,000	+1,167,000
Accumulators.—			
To Sweden	524,000	503,000	— 21,000
„ Japan	213,000	201,000	— 12,000
„ Argentina	2,257,000	537,000	—1,720,000
„ Chile	356,000	371,000	+ 15,000
„ Other countries ...	1,325,000	1,582,000	+ 257,000
Total ...	4,675,000	3,194,000	—1,481,000
Cable.—			
To Belgium	1,510,000	1,520,000	+ 10,000
„ Holland	2,410,000	2,650,000	+ 240,000
„ Norway	443,000	1,871,000	+1,428,000
„ Sweden	1,630,000	744,000	— 886,000
„ British South Africa ...	135,000	1,008,000	+ 873,000
„ Japan	1,139,000	2,024,000	+ 885,000
„ Argentina	2,267,000	4,134,000	+1,867,000
„ Chile	181,000	386,000	+ 205,000
„ Other countries ...	5,387,000	6,894,000	+1,507,000
Total ...	15,102,000	21,231,000	+6,129,000
Arc Lamps.—			
To Great Britain	34,000	33,000	— 1,000
„ Russia	34,000	68,000	+ 34,000
„ Argentina	27,000	46,000	+ 19,000
„ Austria	33,000	27,000	— 6,000
„ Other countries ...	144,000	122,000	— 22,000
Total ...	272,000	296,000	+ 24,000

	1912. Kilogs.	1913. Kilogs.	*Inc. or dec.* Kilogs.
Metal-filament lamps.—			
To Great Britain	150,000	69,000	— 81,000
„ Austria	72,000	84,000	+ 12,000
„ Russia	214,000	98,000	— 116,000
„ Italy	67,000	69,000	+ 2,000
„ Spain	64,000	48,000	— 16,000
„ Argentina	23,000	54,000	+ 31,000
„ Brazil	37,000	43,000	+ 6,000
„ France	39,000	59,000	+ 20,000
„ Other countries ...	281,000	381,000	+ 100,000
Total ...	947,000	905,000	— 42,000
Telephone appliances.—			
To Great Britain	51,000	62,000	+ 11,000
„ France	19,000	31,000	+ 12,000
„ Russia	50,000	60,000	+ 10,000
„ Italy	29,000	50,000	+ 21,000
„ Other countries ...	226,000	224,000	— 2,000
Total ...	375,000	427,000	+ 52,000
Electric light, power, &c., appliances.—			
To Belgium	507,000	627,000	+ 120,000
„ Great Britain	334,000	481,000	+ 147,000
„ Austria	597,000	912,000	+ 315,000
„ Russia	666,000	1,118,000	+ 452,000
„ Spain	219,000	584,000	+ 365,000
„ British S. Africa ...	218,000	179,000	— 39,000
„ Japan	242,000	204,000	— 38,000
„ Argentina	712,000	697,000	— 15,000
„ Brazil	261,000	382,000	+ 121,000
„ Chile	137,000	242,000	+ 105,000
„ Italy	529,000	661,000	+ 132,000
„ Switzerland	266,000	408,000	+ 142,000
„ Other countries ...	1,758,000	2,503,000	+ 745,000
Total ...	6,446,000	8,998,000	+ 2,552,000
Electric meters.—			
To Great Britain ...	48,000	143,000	+ 95,000
„ Italy	151,000	168,000	+ 17,000
„ Austria	196,000	191,000	— 5,000
„ Russia	135,000	242,000	+ 107,000
„ Spain	65,000	119,000	+ 54,000
„ Argentina	59,000	130,000	+ 71,000
„ Other countries ...	405,000	516,000	+ 111,000
Total ...	1,059,000	1,509,000	+ 450,000
Batteries.—			
To Great Britain	105,000	162,000	+ 57,000
„ Holland	54,000	51,000	— 3,000
„ Russia	30,000	50,000	+ 20,000
„ Sweden	17,000	40,000	+ 23,000
„ Switzerland	37,000	46,000	+ 9,000
„ Other countries ...	171,000	263,000	+ 92,000
Total ...	414,000	612,000	+ 198,000
Insulating tubes of paper.—			
To Russia	163,000	192,000	+ 29,000
„ Sweden	121,000	200,000	+ 79,000
„ Switzerland	439,000	419,000	— 20,000
„ Italy	119,000	168,000	+ 49,000
„ Other countries ...	658,000	869,000	+ 211,000
Total ...	1,500,000	1,848,000	+ 348,000
Finished armatures and commutators.—			
To Belgium	224,000	104,000	— 120,000
„ Great Britain	259,000	200,000	— 59,000
„ Italy	313,000	201,000	— 112,000
„ Austria	217,000	281,000	+ 64,000
„ Russia	153,000	232,000	+ 79,000
„ Japan	143,000	202,000	+ 59,000
„ Argentina	118,000	100,000	— 18,000
„ Other countries ...	622,000	890,000	+ 268,000
Total ...	2,049,000	2,210,000	+ 161,000

Kilog = 2·204 lb.

Half-Watt Lamps.—We are asked to correct certain erroneous rumours on the subject of the new "Half-Watt" lamp. The lamp in question will, at any rate for some considerable time to come, only be supplied in units of extremely high C.P. to compete with high pressure gas arcs for street lighting, &c, and, of course, electric arc lamps. It is probable that such "Half-Watt" lamps will be available in commercial quantities during the present year, and Messrs. Siemens Bros. Dynamo Works, Ltd., of Dalston, hope before long to give a demonstration of such a lamp, embodying certain novel processes of manufacture not hitherto applied to electric lamps.

MONOPOLY v. CO-OPERATION: CONSERVATION v. WASTE.

By DOUGLAS S. MARTIN.

It is to be feared that the anonymous article entitled "Co-operation between Private and Public Supply Systems," which appeared in the Electrical Review for March 28th, is likely to lead to a lot of misunderstanding on the part of English engineers, if its statements are accepted at their face value.

The author cannot be blamed for having been fascinated by the scheme proposed by Mr. Percival Moses, consulting engineer, of New York City, and the apostle of the isolated plant—a scheme in which all kinds of industrial waste shall be eliminated through the friendly interchange of power between central stations and isolated plants. Mr. Moses, as is very well-known in America, has been pleading the cause of the isolated plant very eloquently and persistently for many years, knows his subject thoroughly, and is gifted with an easy and convincing style. The writer of the article in question has apparently fallen to him very quickly, but may not be censured on that account by persons who happen to hold views which are the direct opposite of those shared by Mr. Moses. He is deserving of nothing but censure, however, for his reckless jumping to conclusions, and his utterly unwarranted inference that this (to many) wild-cat scheme of power-exchange has any considerable number of adherents in the States.

Let us take a look at the scheme which has been proposed. I have not read this particular article of Mr. Moses in the *Engineering Magazine*, though I am familiar with his writings and views on the electric supply business. I am considering the application to British conditions discussed by the anonymous author. Your contributor's references to the virtues of the private electrical plant in an industrial establishment have possibly misled many readers, for they display a complete ignorance of the *raison d'être* of central station service. Was the writer aware that it is by the cultivation of the diversity factor alone that a central station can be successful; that complete advantage can only be taken of the time diversity of many peaks by throwing them all into one system; that individual peaks —rolling mills, street railways, machine shops, and so on— disappear individually when charted on a magnified picture of the whole load? If he has for the first time now realised these things, can he not see that there is no place for the small plant in this scheme of balance and mutual power flow; that every small plant must go in order to provide all the diversity for the main station which can possibly be obtained? Granting the one point that individual peaks are cancelled out when their circuits are fed from the same systems, and that by this means we are able to care for a maximum diverse time demand, say, of 100,000 KW., with a supply plant of, say, 25,000 KW., then all these smaller plants, feeding their few hundreds of kilowatts into the system, simply represent so much sheer waste of investment. They perform no useful work. The central reservoir is there, and can care for 1,000 KW. of factory motors one minute, for 1,000 KW. of street railways the next, as the workmen ride home, and for 1,000 KW. of house lighting 15 minutes later when the men have reached their dwellings. The essential point is to give the benefit of the diversity to the central station. The idea of the stalwart and all-sufficient central reservoir is an excellent one. Why drag in these diminutive pools of ornamental water, these merest bubbles on the surface?

In regard to another section of the article, of course, the load density in a given locality may increase to such a point, and the physical location of the load centre may be such, that it may become advisable to erect an auxiliary station to care for it. But the prime essential remains the same; when the auxiliary station is built and put into operation, it must be a big station, in order that its efficiency may be high and "industrial waste eliminated," and it must be given as high a diversity factor as possible. To that end every isolated plant in that locality must go out of business, all this aggregation of petty coal bills and petty

labour bills must be eliminated, and the beautiful reservoir must be left to itself to work out a true programme of conservation. London is far bigger than any American city, but London has not yet grown anywhere near the point beyond which the cost of transmission from a central plant would become anything to worry about, compared with the overwhelming economy in actual generating costs which such a scheme would make possible. The watts lost in the mains would not amount to a millionth part of the awful waste which is now going on in thousands upon thousands of individual hand-fired boilers. Certainly, auxiliary and supplementary stations would be built to care for the distant loads; and in cases where the distance became really great, the bus-bar voltage would be stepped up to 33,000, or 66,000, or 110,000 for transmission to the next big town, and for tying-in with the supply bus-bars there. But where on earth in this scheme is there any room for the small station? Three main generating stations at Birmingham, Bristol, and Greenwich, could probably care for the whole of the South of England if *every* isolated plant were shut down; if the main transmission lines were carried cross-country, by Act of Parliament, at 110,000 volts; if the distribution feeders were run at 33,000, and local lines at 11,000 volts; or, in general, if the most economical voltages were selected for the various locations and the various loads. You would get all the balancing effect that you would want out of such a system as that; and so far from admitting that the scheme of Mr. Moses is one "which it is practically certain will become more and more realised as time goes on," I would willingly forecast, baseing my view on the extraordinary progress which has been made in America in the last three years in tying-in main stations and systems, at extra high voltages, situated many hundreds of miles apart, that in 50 years from now some such scheme as this will actually be in operation, and the isolated plant will be an utterly extraordinary thing.

In this scheme, therefore, the isolated plant receives no consideration as possessing any of the elements of real economy; and it can be shown that, where new construction alone is in question, nothing should be done to increase the number of such plants now in operation. Where the starting point of the argument is that isolated plants do, in fact, exist, and that we must, adjusting ourselves to conditions as we find them, evolve some scheme for cutting down the waste to the greatest possible extent, we find that the scheme which has been proposed even then is not the one which will produce the best results. Assuming that the isolated plants are there, and that they have got to be used, it will appear that the maximum of waste can be prevented, and the maximum of time, money and energy conserved, if they are operated for as short a time each day as possible—not that the boilers are kept constantly under steam with the generators pumping into the ring, according to the picture drawn in the article under notice. When an individual factory owner is already in possession of an isolated plant, the best use he could make of it would be to keep it as a stand-by for his peak, assuming that during the day his individual peaks are not worth worrying about, and that the only peak to be considered is his 4 o'clock winter peak, which his private plant, anyway, would be incapable of handling unless it were over-powered to an extent excessive for its normal load. Under such conditions, it would be economical for him to allow his plant to stand idle during the steady portion of the curve, taking all of his power from the supply company's mains; and to start up and throw in his isolated equipment as his peak came on, taking the necessary precautions to see that his generator carried sufficient of the peak load to prevent any of his maximum demand from reaching the company's meter. I am not saying that this course would not be beset with difficulties, and that some time or other he would not let his peak register on the mains. All I contend is that he might draw his 50-KW. normal load from the line during the daytime; and, when he knew his heavier load of 150 KW. or 200 KW. was coming on, he might start up his small set—not with the idea of helping out the central station, but of saving money for his own pocket. If the same plan were followed by 50 other factories in a single town, each already possessing a private plant, the net result would be that the maximum degree of conservation would be realised in the whole community, and the central station, theoretically, would be able to operate on an even load with a factor of 75 to 100 per cent. Disregarding the "theoretically" in the foregoing statement, it is immediately obvious that such a scheme, while representing the best possible returns for the individual owners of existing equipment if any scheme of tying-in is going to be adopted, actually will not be so economical to the individual as operating entirely independent of the central supply; and it is hardly necessary to point out that this method of relieving the central station from the peak by splitting it up into 50 or more individual peaks is frightfully extravagant, compared with the straight central station scheme of carrying all the combined peaks, which will themselves show some diversity on a single large-capacity set, fired and sent into operation for the purpose of the peak. It is better to remove the individual day-peaks, having some inevitable time-diversity, by carrying them all on the same system, and allowing them to level each other out. It is better to meet the total afternoon peak by the provision of as few and as large single units as possible. In any case, cut out the small isolated plant.

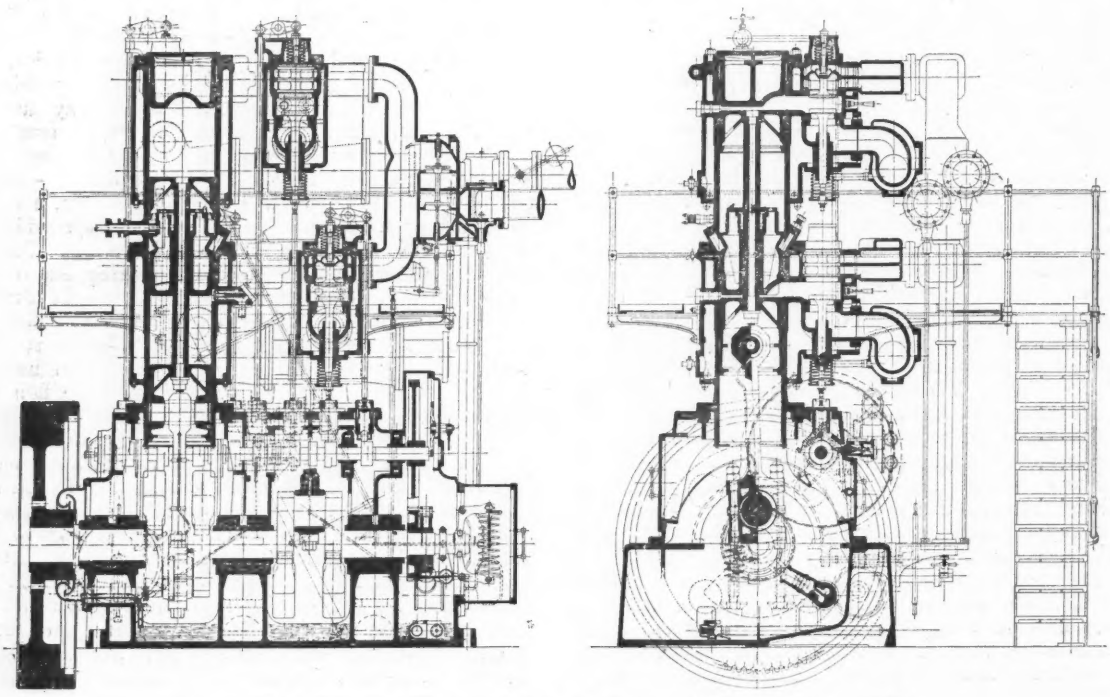
All this, of course, is, after all, a matter of opinion, and I am no more entitled to my views than is the writer of the earlier article entitled to his. My main quarrel with him is his reference to the line along which American engineers are bending their energies, and of the direction of which he is obviously ignorant. Everyone in the States is looking towards the bulk-supply idea — not because Americans necessarily worship the large corporation, but because in the electrical supply business competition is a sheer waste and hindrance, and economy lies in monopoly-regulated monopoly. The supply companies in the big cities are meeting with a lot of competition from the isolated plant, but they are fighting it—cleanly and openly—with every means in their power, and will eventually win out. Right is on their side, if we judge right by the standards of achievement. Perhaps the competition is a good thing in spurring the central stations on to great achievement. Certainly all the advances which have been made in the progress of the electrical age in America have been made by the central stations. The manufacturers have put their best engineering into the development of apparatus for the big supply systems; it is only through the big systems that electrical service has become a real achieved fact in American everyday life, in street railway, in factory, in theatre, in dwelling place; and it will only be through the further development of the big-station idea that electrical service will be made increasingly available to the mass of mankind. Where they have to fight the isolated plant, central station men fight it not through personal animus towards the leaders of the movement, but because they are acting according to their convictions, and their convictions tell them that the isolated plant means waste. Therefore, they must set their rates to kill the isolated plant—not because they delight in killing, but because their line of business can only be run efficiently by raking in all loads and every kind of load.

Co-operation on these lines is therefore out of the question, because, in the first place, any such scheme must, from the nature of it, be incomparably inferior to a straight central station supply scheme; and because, in the second place, central stations are too much occupied with the development of their own engineering ideas along sound lines to have any care for propositions of this—at best—makeshift character. "An indication of the line of thought which is being actively pursued in America" can be gained from noting what is really happening in this country, in a territory where a network is being set up which is already within measurable distance of the ideal forecasted by Edison, Ferranti, and Steinmetz—no small fry here, no duplication and multiplication of buildings, boilers, bunkers, boosters, and bus-bars, but a few giant steam and hydraulic stations turning out their load according to a real schedule of conservation. . . . "The economical operation of such systems as the Southern Power Co., a large network in itself, which is tied in with the Yadkin River Power Co., at Method, and is contemplating tying in with the Georgia Power Co., at Easley, and the latter with the Tennessee Power Co., at Rome, is a problem of considerable importance. The Southern Power Co. is operating approximately 350 miles of 100,000-volt

lines as well as an extensive network of 44,000-volt and 11,000-volt lines, and the Yadkin River Power Co. has approximately 190 miles of 100,000-volt lines. The Georgia Power Co. will have approximately 200 miles of 100,000-volt lines, and the Tennessee Power Co. nearly 200 miles of 120,000-volt lines, as well as approximately 100 miles of 66,000-volt lines, making a total of nearly 800 miles of 100,000-volt lines in the four systems, and hundreds of miles of lower voltage lines, all tied in one vast system. The total distance by transmission line from Blewetts Falls to Nashville will be over 700 miles."

THE NATIONAL GAS ENGINES AT ACCRINGTON.

In our last issue we described and illustrated the Mond producer and gas-engine installation, which is now in use at the Corporation Electricity Works, Accrington. As the engines used in this plant, which were supplied by the National Gas Engine Co., of Ashton-under-Lyne, are of considerable interest, embodying many recent improvements, a more extended description of them may be of interest.



Sectional Views of Two-Crank Vertical Tandem "National" Gas Engine.

They consist of two 1,000-B.H.P. vertical four-crank enclosed gas engines, fitted with two tandem cylinders to each crank—eight cylinders in all—and running at a speed of 200 R.P.M. As mentioned last week, each engine is direct-coupled to a Peebles three-phase 50-cycle 6,600-volt alternator rated at 938 K.V.A., ·8 power factor, and designed for 25 per cent. two-hour and 50 per cent. momentary overloads. The engine being of the four-cycle single-acting type, with four pairs of tandem cylinders, the crankshaft receives four impulses per revolution, or 800 impulses per minute; by employing eight cylinders, the cylinder diameter can be such that water-cooled pistons and exhaust valves are dispensed with, water cooling only being used for the cylinder covers and jackets.

The engine is of the totally enclosed type, fitted with forced lubrication throughout; the oil pumps are valveless and in duplicate, and suck from oil filters also in duplicate, which can be removed for cleaning purposes, one at a time, whilst the engine is running without any fear of dirty oil being drawn into the system. The oil pumps deliver through an oil cooler, through the internal tubes of which the whole of the cold water passes on its way to the cylinders.

The engine bearings have cast-iron shells lined with white metal; for operating the valve gear a two-to-one steel reducing gear is employed with helical teeth, the large gear being on a camshaft which is carried in bearings supplied with oil under forced lubrication. All the cams and rollers are of case-hardened steel.

One end of the crankshaft carries the governor for regulating the speed, which actuates the valves in the throttle box for both gas and air; the usual speeder gear attachment is provided. The connecting-rods have marine adjustable ends both top and bottom; the cylinders are without liners, and the top cylinder is a separate casting from the bottom one.

Extreme care has been taken in providing for expansion, in evidence of which the company have not yet had the misfortune of a cracked cylinder with these engines working on producer gas, and only in exceptional cases due to bad water and shortage of water have they experienced any difficulty of this kind with an engine working on coke-oven gas.

The exhaust pipes are also provided with exceptional facilities for expansion, the idea running through the whole design of this engine being to free castings from initial stresses.

The bottom pistons are of the usual trunk type, fitted with case-hardened steel piston pins of exceptionally large dimensions; Ramsbottom rings are fitted to each piston. The top and bottom pistons are connected by a cast-iron sleeve ground true in the lathe along with the pistons, which acts as a distance piece and as a means of packing the space between the two pistons. Through the centre of the sleeve a chrome-nickel steel bolt is fitted, holding the two pistons rigidly together. The sleeve when in action works up and down in metallic packing placed in the middle cover or intermediate head, which is stationary and retained by radial screws; the packing is composed of many cast-iron rings working on the cast-iron sleeve, an arrangement which is found, with a normal amount of lubrication, to have a very long life, in fact, after a year's continuous running no shoulder is usually formed on the rod. The top cylinders and metallic packing are lubricated from a sight feed lubricator driven off the camshaft.

The inlet valves are fitted in a self-contained cage, complete with operating lever, spring, and valve stem guide, and are provided with an isolating gas valve, in order to prevent the gas and air uniting and forming an explosive mixture in the inlet pipes. This gas cone valve is firmly secured to the spindle, as experience has shown that springs in this position

very soon break or lose their temper. The exhaust valve is of cast-iron, with a short steel stem at the lower end to carry the spring; no water cooling is employed; the valve is provided with a renewable seat. The time required to take out an inlet valve does not exceed 10 minutes, the bottom inlet valves being equally as accessible to the crane as the top ones; about the same time is required to withdraw an exhaust valve, and a line of pistons may be taken out of these engines when hot within the hour. The general design of these engines is shown in the sectional views, which, however, show a two-crank, not a four-crank engine.

The ignition system is in duplicate, low-tension magnetos being provided, which are driven by means of a heavy silent chain from the camshaft. The current from the low-tension magnetos is passed through coils, the high-tension current resulting being supplied through a distributor to the various plugs in due rotation. Each cylinder has two sparking plugs, each plug deriving its current from an independent source.

Facilities are provided on the end of the camshaft for indicating the starting position of the engine, also a very neat safety barring gear is supplied for turning the engine round.

In connection with the governing, a safety governor—or runaway governor—is fitted, usually arranged to come into action if the speed of the engine exceeds 12 per cent. above the normal.

It is found from experience that this type of engine is extremely easy to handle, and especially good at paralleling; the usual time taken to parallel two of these sets, from the time of turning air on to being in parallel, is about a minute and a quarter. The remarkable flexibility of this type of engine was shown by an accident which occurred to one of two engines in a colliery power station operating on coke-oven gas. The accident was due to unsuitable water, causing accumulation of sediment in cylinder jackets, covers and exhaust pipes, with the usual result of a seized piston. The piston line was completely withdrawn, and the engine ran in parallel with the other three-crank engine on a 50-cycle supply within three hours, and did a proportionate amount of the load.

It may be noted that the Accrington engines are operating on gas produced in a Mond by-product recovery plant, the percentage of hydrogen in a gas of this nature being about 27 per cent.; one engine is running 165 hours per week and the other is working cotton mill hours, viz., 56 hours per week. The oil consumption for the whole of the above plant for one week is 35 gallons, and the fuel consumption per unit generated averages rather over 1½ lb.

The complete arrangement of the engines at Accrington, together with the water coolers, exhaust boilers, compressed air starting, &c., was illustrated on page 258 of our last issue. The cooling water from each engine is circulated by a motor-driven centrifugal pump through a Little's cooler, made by Messrs. Heenan & Froude; the waste heat boiler for each engine is of the tubular type, by Messrs. Adamson and Co., and generates about 2 lb. steam per B.H.P.-hour at 100 lb. pressure at full load.

A motor-driven three-throw boiler feed pump is installed, drawing its water from a portion of the cooling water passing round the exhaust pipes on the engines, at a temperature of about 130° F. In conclusion, we are indebted to the National Gas Engine Co. for the above particulars of their engines.

Heywood. — Bulk Supply Arrangements. — The question of obtaining a bulk supply from the Bury Corporation was discussed at a meeting of the T.C. on August 14th. Councillor J. Ashworth said prices had been obtained from the Bury Corporation and from the Lancashire Electric Power Co., and the offer of Bury had been accepted for a supply for a period of 10 years, with the option of a further five years. The result, in the opinion of the engineer, would be a saving of £1,388 per year. To take on this supply it would be necessary to expand an approximate sum of £12,000 for transforming plant, cables, &c. The interest and sinking fund on this would be £750 a year, and when this £750 had been met, the net gain to the Corporation would be £1,388 per year. Had they decided to build new works to have met expected future demands, they would have been faced with an additional expenditure which, with present capital charges, would have meant a total capital expenditure of £84,000. The Committee felt that when the arrangements were completed the Corporation would be in a position to supply large consumers on equal terms with neighbouring authorities. The [arrangement for the bulk supply was unanimously supported.

DELIVERIES.

[COMMUNICATED.]

In the early part of the year a leading article in the Electrical Review* dealt concisely with the question of the personal factor in the engineering world, in the course of which attention was drawn to a number of causes having varying effects upon the present-day progress of manufacturers engaged in the electrical industry.

Not least amongst those mentioned is the time taken for the execution of orders, and although it is only reasonable to suppose that all our manufacturers are giving this vexed problem every attention, yet beneficial results do not, on the face of things, seem very apparent.

There may be a few purchasers of electrical machinery and apparatus who have not had their arrangements considerably hampered by repeated delays in delivery of orders guilelessly given in the hope of being executed in a reasonable time, but certainly these are not many and their less fortunate friends feel that the average manufacturer has more than a double dose of original sin, whilst the friction engendered by the contractors' delinquencies, unfortunately, is in no way relieved by the total inability of their customers to understand or to appreciate the difficulties with which the manufacturer has to contend, particularly in boom periods.

For some considerable time there has been observed a tendency in certain directions to adopt an independent attitude, no doubt due partly to that element of human nature which asserts itself when it is possible to pick and choose the more profitable class of business. When, however, the volume of business wanes, this attitude will vanish more quickly than it appeared, and, no doubt, those manufacturers who at the present time are observing the interests of their clients to the best of their ability, are surely also improving their own position, and will find it easier to withstand the inevitable slack time, for, despite the cynic, sentiment fortunately still has a voice in the business world.

It must not, however, be assumed that the electrical manufacturers are the principal culprits in this respect, because this is not the case, the trouble having been experienced throughout every branch of the engineering trade, and, no doubt, in others. The iron and steel people in particular have really been so flooded out with orders as to have been obliged to refuse business in large quantities, and this, coupled with similar, if lesser, difficulties in connection with other raw materials, is one of the legitimate excuses the electrical manufacturers can put forward—for common justice compels the statement that some of the reasons for bad deliveries *are* perfectly legitimate. The miners' strike of last year is now ancient history, but it is necessary to refer to it, because this conflict was the cause of more deep-seated trouble than any other industrial occurrence of recent years, and far-fetched as the statement may seem, it is quite conceivable to the insider that its effect had not entirely worn off until a comparatively recent date; this, despite the prevailing impression that the explanation was worn threadbare long since, and that the strike was a perfect godsend to the manufacturer in the way of providing prolific excuses. It is only necessary to refer to the annual reports of most trading concerns in the country to see how far-reaching the effects of the coal strike really were, and what a lengthy time elapsed before a normal condition prevailed.

So much having been said by way of extenuation on account of the "boom" and "strike" phases of the situation, what cannot be defended is the unreasonable times often taken for execution of work, when trade is slack. The fact that when work is scarce the number of hands employed is considerably reduced, and that other facilities are curtailed, cannot carry much weight, because there is in all shops an irreducible minimum of skilled labour, to go below which would be a suicidal policy on the part of the management, and the ratio of this minimum to the work in hand is proportionately greater in slack times. Again, it is obvious that, if only from a monetary point of view, it should be the manufacturer's principal aim to execute orders in the shortest possible time, for it will be appreciated that the sooner he effects delivery, so automatically his account is

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* Issue dated March 14th.

more quickly due for payment. Everyone is familiar with the sign frequently posted in the windows of retail tradesmen reading—"Small profits, quick returns"; this, with little or no modification, may very aptly be applied to the electrical industry, in so far as this question of delivery is concerned, not to mention any others, when a radical alteration might be essential.

Generally speaking, the principal causes of delay are, perhaps, to be briefly summarised as: difficulty in obtaining raw material (already dealt with above), congestion in the drawing office and factory, manufacturing troubles, whilst possibly red tape also has its victims. It may, however, be reasonably urged that, with a certain amount of foresight, these difficulties can be more or less guarded against, and, consequently, such excuses are beside the mark. On the other hand, there are very many contingencies which will readily occur to most readers, against which it is quite impossible to introduce any form of safeguard; for example, a reasonable promise of delivery may be given in all good faith with a tender, but in the interim between submitting this and the receipt of the order, the factory's facilities may well have been swamped by a bulk order. Naturally, in such circumstances the correct procedure is at once to acquaint the client of the altered position of affairs, explaining fully its effect upon his order and ask his indulgence, but it is too often the case that our friend the manufacturer, hoping for something to turn up and afraid of cancellation, says nothing, and eventually finds his Micawber-like policy is but leaning on a broken reed, that he has put his client in a predicament, and seriously prejudiced future prospects. It should be unnecessary to point out the obvious flaws in this attitude, but unfortunately for the welfare of the industry at large it is too common. However, ignoring such contingencies as herein mentioned, it should be a reasonably safe policy, when estimating deliveries, to strike a mean between the times usually taken by the factory in the past for making similar apparatus or material, say, over a term of 12 months; of course making, where necessary, due allowances for increased or decreased manufacturing facilities.

Again, one is prone to suspect that very frequently promises are made, perhaps under pressure from the customer, which in the very nature of things, cannot reasonably be maintained, the result being that an unenviable reputation militating against repeat orders is quickly acquired.

Taking all things into consideration therefore, it is not necessary to seek very far to ascertain the reason for the prevalence of that bugbear, the penalty clause, the dislike of which is in no way diminished by its "liquidated damages" *nom-de-guerre*, and very rarely indeed, made equitable by the addition of a corresponding bonus clause.

Another aspect of this liquidated damages clause is that it is somewhat enlightening and annoying to the prospective purchaser, if he compares the time of delivery he is quoted for identical apparatus—(*a*) without a penalty clause; (*b*) with a penalty clause; (*c*) with a bonus clause; (*b*) and (*c*) being added at succeeding stages of the correspondence. In the case of (*c*) the position grows quite interesting to behold, for almost invariably the manufacturer lays himself out to earn the bonus and frequently succeeds, not realising that by so doing he is perhaps laying his good faith open to imputation. Of course comment is needless, and it is reasonably safe to assume that the other orders in the shops suffer in a greater or lesser degree.

It is a moot point if the larger manufacturers or the small specialising firms are the bigger sinners; in all probability there is not much to choose between them, for whilst we are all familiar with the negative statement concerning the spiritual and physical welfare of big industrial corporations, yet the larger firms, with their special routine, if well schooled and free from red tape, are in a better position to obtain raw materials than their smaller competitors, if only on account of their being able to bring greater pressure to bear upon their suppliers. On the other hand, it is equally true that the small specialist manufacturer is able to devote much more personal attention to the progress of the order through all its stages.

In the foregoing, undue prominence has been given to the customer's point of view, but it must not be assumed that the trouble is one-sided in its origin. Quite the reverse, and undoubtedly manufacturing problems would be much easier of solution if consulting and supply engineers and other purchasers did not expect the impossible, but endeavoured to adopt a more tolerant attitude than is sometimes the case. By allowing really ample time for the execution of the work, the buyer helps matters mutually all round, and in this connection it is very often the case that the ample time may be given by the simple expedient of not taking unnecessarily lengthy periods for the consideration of the various tenders. He himself is benefited by receiving a lower price, for it is not to be wondered that the manufacturer—knowing he is going to be allowed but a short delivery, and, furthermore, to be saddled with a penalty clause—is going to take care of possible contingencies in his price.

ELECTRIFICATION OF THE CANNOCK CHASE COLLIERY.

A PAPER on the above subject was read before the South Staffordshire and Warwickshire Institute of Mining Engineers by Mr. S. F. Sopwith, of which the following is an abstract:—In view of the effect of additional legislation to increase cost of production, it has become essential that modern methods should be introduced into the older collieries if the all-too-narrow margin which normally exists between costs and sales is not to be reduced to vanishing point.

It was on this account that the Cannock Chase Colliery Co. decided to adopt electricity, with a view to reducing colliery-consumption and providing a means of transmitting power underground for haulage and other purposes. The substitution of electric drives for the screens and picking-belts formed the nucleus of the scheme, which has gradually been extended in other directions.

In the power station, steam at a pressure of 165 lb. superheated 100° F., is raised in two Lancashire boilers. A third boiler is provided as a stand-by, and a fourth is in course of erection. Feed-pumps of the Weir type supply hot feed-water to the boilers through a Babcock & Wilcox heater, the heat being obtained from the exhaust of the engines, which passes to the atmosphere.

The generating plant consists of three direct-coupled steam alternators, two being of 200 and one of 500 KW. capacity. The engines are compound and triple expansion respectively, and together with the alternators were made and supplied by the Brush Co. The switchboard is of the Ferranti remote-control type.

Three-phase current is generated at 3,000 volts and 50 cycles, and distributed by overhead bare copper conductors, supported on creosoted redwood poles, to sub-stations at Nos. 2, 3, 7 and 8 Pits, where it is transformed to 600 volts. Lightning arresters are placed at the power station and sub-stations, and at one point between the two.

The plant at No. 2 Pit sub-station consists of a 100-KW. transformer of the core type, stepping down from 3,000 to 600 volts. Current is supplied underground for a 75-B.H.P. motor that drives the main endless haulage-gear, and two 10-B.H.P. portable haulage-gears. On the surface a 20-B.H.P. motor drives a creeper and screen-conveyor of the Marcus type; a 20-H.P. motor drives the sawmill, and a 20-H.P. motor drives a crosscut saw for cutting mining timber. The 75-B.H.P. motor was applied to the crank-shaft of the old steam-driven gear through epicyclic reduction-gear, the ratio of speeds being 960 to 90 R.P.M. This gear, known as the "Whitehall," and made by Messrs. Strachan & Henshaw, serves the double purpose of reduction-gear and clutch, the motor running continuously.

At the No. 3 Pit sub-station two transformers of 100 and 50 KW. capacity respectively supply the current for two 20, one 40, and one 5-B.H.P. motor for driving the screens and picking-belts, these motors having replaced numerous small steam engines. One 40-B.H.P. motor drives a three-throw pump underground.

A 15-B.H.P. motor drives a crosscut saw and a small saw-bench for cutting mining timber into lengths, making sleepers, &c. Current is also supplied to a Simplex coal-cutter with a motor of 20-B.H.P.

At No. 5 Pit, the high-tension current is taken direct from the power station bus-bars down the shaft, where it drives a motor of 180-B.H.P. operating a main-and-tail haulage-gear about a mile from the shaft inset; a 70-B.H.P. haulage-gear and a centrifugal pump of 25-B.H.P., the current for the latter being transformed to 600 volts on the spot. Arrangements are being made for the installation of a 40-B.H.P. main-and-tail haulage-gear, a 20-B.H.P. hoist for winding coal from a lower level, and a small compressed-air hammer-drill plant.

At No. 7 Pit sub-station, one 50-KW. transformer supplies current for a 25-B.H.P. turbine pump at the Five-Foot level, at a depth of 257 ft. from the surface. A small feeder of water (chiefly from the shaft garlands) is dealt with at the Old Park level 408 ft. from the surface by a hydraulic motor driven from the turbine-pump rising-main, which raises the water to the main lodge-room.

No. 8 Sub-station contains three 50-KW. transformers, shortly to be replaced by two of 100-KW. capacity, which supply current

on the surface for two 20-B.H.P. motors for driving the screening machinery, and underground for one 120-B.H.P. main endless haulage, two 30-H.P. auxiliary main-and-tail haulages, and one 10-H.P. portable main-and-tail haulage. A portable compressor and hammer-drill equipment have recently been installed, and other small haulages are in contemplation. The existing transformers will be used underground where required.

Arrangements for conveying the current to the company's pits at Hednesford are in progress. The overhead bare wires will be connected through a switch on the surface to the main shaft cable and the pressure will be transformed to 600 volts, and used for haulage, heading, and coal-cutting purposes.

The cables for medium pressure are three-core bitumen-insulated throughout, and paper-lead covered, and the high-tension cables are doubled-armoured with steel tape and wire.

In addition to the foregoing plant, lighting transformers are placed underground at important junctions, and in some cases supply current on the surface.

The following is a summary of the cost of the entire installation :—

POWER STATION AND TRANSMISSION LINES.

Power house, boiler house, buildings, boiler seatings, engine foundations, &c....	£4,000
Two 200-KW. steam alternators	2,500
One 500-KW. do. do.	2,574
Switchboards and fittings	520
Three boilers, pipework, feed pumps, superheaters, feed-water heater, &c.	3,289
Transmission lines to connect to sub-stations ...	562
Total	£13,445

SUB-STATIONS.

Adapting old buildings at Nos. 3 and 8 Pits, and building new houses at Nos. 2 and 7 Pits, say	£200
Transformers	1,167
Switchboards and fittings, cables, &c.	2,059
Motors, haulage gears, pumps, &c.	3,888
Labour and excavation for motor houses, laying cables, &c.	500
Total	£7,814

Thus the total capital outlay on power and sub-stations, mains, &c., was £21,259.

It may be pointed out that in certain cases additional steam-power would have been necessary to carry out what is now being done electrically.

It is interesting to note the cost of generation, which compares favourably, even in the case of a comparatively small plant, with the cost of buying current from a public supply company. There are undoubted advantages in the latter method, and had there been such a company existing from which to buy power the pros and cons would have been seriously considered. The cost per unit for the half-year ended December 31st, 1912, was as follows :—

Wages...	£223·2
Fuel, 1,506 tons of slack at 6s. per ton	451·8
Stores...	40
Depreciation and interest on power station and transmission lines, at 10 per cent. on £13,445	672
Total...	£1,387
Total units	337,000
Cost per unit	0·987d.
Normal load	about 350 KW.
Load factor	15 to 20 per cent.

The advantages derived from the adoption of electricity may be summarised as follows :—(1) The colliery consumption has been reduced by at least 1¼ per cent., say 6,875 tons. (2) Some 25 horses have been dispensed with underground. (3) A great reduction in labour has resulted from the substitution of mechanical for horse haulage. (4) The Lancashire boilers no longer required (owing to the conversion of steam to electric power) are being utilised at other pits to supersede old egg-ended boilers, thereby reducing labour and consumption. (5) The current is available underground for further extensions in the way of auxiliary haulage, coal cutting, &c., and for lighting up important stations, which, if not actually economical, is more convenient and safer.

The annual saving effected is shown in the following table :—

Colliery consumption, 6,875 tons at 4s. 6d. per ton		£1,546
25 horses less at 10s. each for fodder, &c., per week	£650	
50 boys at 2s. 6d. each = £6 5s. per day, or for year of 250 days ...	1,562	
	£2,212	
Less wear and tear on ropes, hauliers' wages, &c. (10 men at 5s. per day, or for year of 250 days), say ...	622	1,550
Reduction in hauliers due to the substitution of main-and-tail for endless haulage		500
Substitution of mechanical for hand-sawing of timber		250
Screen engine boys, &c.		100
Total annual saving ...		£3,946

The total saving thus represents about 18½ per cent. interest on the capital outlay, apart from any saving derived from the use of portable compressor plant and power drills, which have fully justified their adoption during the short time that they have been in use.

In the discussion which followed (according to the *Iron and Coal Trades Review*), one speaker criticised the scheme which had been adopted, holding that it would have been cheaper to have improved the existing steam plant, or wait until electrical power came along at a cheap rate. Mr. Bernard Clark, being somewhat familiar with the plant and difficulties which had to be overcome, considered that electricity had only been applied where there was an obvious saving or other advantage, and that the design of the plant left little to be desired. The cost of production was high, on account of the low load factor, which would improve as the plant was extended. At a Welsh colliery power station where the working conditions were better, the output being 82,000 units per week, and the load factor 50 per cent.—60 per cent., the total generating and capital costs per unit were ·36d. The plant capacity was 5,000 KW., and the normal load on the main shaft 3,000 KW. Other speakers held that with a load factor of 15 to 20 per cent., the costs were quite satisfactory, and these might have been manipulated and made much lower if other figures had been chosen for depreciation. It was the first H.T. plant in the southern part of the county.

The Author, who received a cordial vote of thanks, dealt briefly with the proposals of a certain power company which had not materialised, but which if certain guarantees of load had been forthcoming, would have been prepared to supply at between ·36d. and 1d. per unit according to load factor. The Cannock Chase plant was rather large for the present load and the load-factor was low, and, under these conditions, he did not think a cost of under 1d. per unit could be expected. He briefly described the conditions which had to be met, pointing out that some endeavour to standardise in motors and transformers had been made, and that exhaust turbine plant was unsuitable on account of the cost of condensing. In the first instance, unarmoured cables were used underground; in other cases armoured cables were used everywhere, double-armoured for high-pressure, and single-armoured for medium pressure. Double wire-armoured shaft cables were used, and the earthing was through the armouring to the surface. The unarmoured underground cables were earthed through an old wire haulage rope.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

SWEDEN.—The Board of Trade have received a copy and translation of a new Swedish Law, which contains some important provisions regarding the marking of goods imported into Sweden. Sec. 1 of this Law contains the following provisions :—

Goods bearing a label which gives them the appearance of having been produced or manufactured in Sweden may not be imported from abroad for sale.

The fact that goods bear a label written in the Swedish language or bear a picture with a Swedish motto shall, even if in the latter case the picture is accompanied by an explanation, not be considered a hindrance to the importation of the goods.

The above prohibition does not apply :—

When it is obvious that the goods were really produced or manufactured in Sweden and have previously been exported from the country ;

When the mark attached according to custom of trade is only intended to demonstrate the nature of the goods (generic marking); or

When, besides the Swedish mark of origin, it is stated on the goods in a clear, easily visible and permanent manner, that the goods are of foreign origin.

The Law also provides that goods prohibited by Sec. 1 shall be seized by the Customs officers.

The owner or consignee of the goods shall be afforded an opportunity of defending himself in the proceedings before the Administration. The goods are to be declared confiscated if the Administration finds that they were legally seized by the Customs officers, unless the prohibited marking thereon can be erased or the goods supplied with such markings as shall indicate their foreign origin. In addition, the consignee or owner shall be liable to a fine.

The provisions of this Law also apply in cases where illegal marks are affixed to the coverings in which goods are packed when imported, provided that the coverings are of such a nature that the articles are intended to be sold therein.

Sec. 18 of the Law deals with the importation into Sweden of goods which bear false *foreign* marks of origin, and is to the effect that if they are marked as being the origin of a country which has a treaty with Sweden for the mutual protection of marks, whereas they are in reality the origin of some other country, they may be confiscated in a similar manner to that described above, and may only be admitted for sale if and when the false marks have been erased or the real country of origin indicated.

NEW PATENTS APPLIED FOR, 1913.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

17,816. "Mine signalling apparatus." R. Nicholas. August 5th.

17,821. "Enumeration of telephone calls." S. D. Williams. August 5th.

17,836. "Electric fire-alarm and the like." V. M. Wolbrauch, trading as V. Wallace and H. L. Read. August 5th.

17,849. "Shade or globe supports for gas or electric incandescent lights." Mrs. J. N. Mollett. August 5th.

17,859. "Wireless signalling." R. C. Galletti. August 5th. (Complete.)

17,879. "Electric relay." Siemens & Halske Akt. Ges. Addition to 17,137/13, Convention date, November 18th, 1912, Germany.) August 5th. (Complete.)

17,889. "Portable electric lighting apparatus." H. H. Hirsch. August 5th. (Complete.)

17,899. "Electric switchgear." J. A. Hirst and P. S. Brook. August 6th.

17,907. "Electric arc lamps." W. R. Ridings. August 6th.

17,918. "Electric imitation candle lamps." Chandolite Co. and F. Taussig. August 6th. (Complete.)

17,922. "Means for regulating the efficiency of electric-current generators working at variable speed." F. Eichert. (Convention date, April 4th, 1913, Germany.) August 6th. (Complete.)

17,925. "Electrodes." Fried. Krupp Akt. Ges. (Convention date, September 18th, 1912.) August 6th.

17,926. "Electrically-controlled valve." H. J. Read and W. J. Branson. August 6th.

17,927. "Optical pyrometers." Siemens Bros. & Co., Ltd. (Siemens and Halske Akt. Ges., Germany.) August 6th. (Complete.)

17,947. "Thermo-magnetic current consumption regulator." G. B. Caminati. August 6th. (Complete.)

17,954. "Lanterns for electric-filament lamps." A. G. Bloxham. (R. Bosch (Firm of), Germany.) August 6th. (Complete.)

17,969. "Electric ozone generators." C. W. Denny. August 7th.

17,996. "Protective devices for electrical apparatus." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) August 7th.

17,997. "Electrical starting apparatus for internal-combustion engines." H. W. van Raden. August 7th.

18,002. "Heating elements of electric cooking and heating apparatus." M. J. Railing and C. H. Archer. August 7th.

18,008. "Train electric control systems." B. Starié. August 7th.

18,018. "Telephone transmission systems." Western Electric Co., Ltd. (F. T. Woodward, Belgium.) August 7th. (Complete.)

18,019. "Automatic signalling and alarm systems for railways and the like." O. M. de Munnick. August 7th. (Complete.)

13,024. "Wireless apparatus." G. E. Heyl and T. T. Baker. August 7th.

18,032. "Dials and indicating mechanism of meters for registering supplies of electrical energy." J. W. Beauchamp. August 7th.

18,072. "Electric furnaces." W. N. Grafts. August 8th. (Complete.)

18,073. "Electric shaft furnaces." W. N. Grafts. August 8th. (Complete.)

18,102. "Process and apparatus for the electrolysis of halogen alkalies." Siemens & Halske Akt. Ges. (Convention date, February 20th, 1913, Germany.) August 8th. (Complete.)

18,103. "Apparatus for measuring the magnetic potential between any two points of a magnetic circuit." W. Rogowski. (Convention date, August 9th, 1912, Germany.) August 8th. (Complete.)

18,106. "Supplying current for electric devices for setting the points of electric railways with sliding bow and roller-bow arrangements." G. Breucker. August 8th.

18,110. "Arc lamps." H. Ayrton. August 8th.

18,122. "Telephone exchange systems." Western Electric Co., Ltd. (F. T. Woodward, Belgium.) August 8th. (Complete.)

18,128. "Railway safe-running device." A. R. Angus. August 9th.

18,138. "Engine-room telegraph apparatus for ships." L. Hauxwell. August 9th.

18,160. "Telephone locking system." W. A. Morse and A. M. Morse. August 9th.

18,164. "Battery regulators." E. Lowe. August 9th. (Complete.)

18,170. "Cables for the transmission of electric energy." J. G. Cunliffe and R. G. Cunliffe. August 9th.

18,171. "Iron alloy for dynamo-electric purposes." W. Rubel. (Convention date, August 24th, 1912, Germany.) August 9th. (Complete.)

18,178. "Electric motors." H. A. Whiteside. (Convention date, August 10th, 1912, United States.) August 9th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1912.

Contact Fingers for Electric Controllers or the Like. A. H. S. Dyer. 13,695. June 11th.

Apparatus for Electroplating. G. P. M. Lee and W. A. Brame. 13,746. June 12th.

Means for Securing Electric Continuity in Metallic Conduits. Electrical Conduits, Ltd., and J. R. A. Hemming. 16,104. July 10th.

Electric Discharge Apparatus. R. Moretti. 16,164. July 10th. (July 15th, 1911.)

Track Apparatus for Operating Railway Signals. L. Ducellier and H. Guillon. 16,534. July 15th.

Displaying Advertisements in Connection with a Transparent and Reflecting Screen. Ludwig Macho & Co. 16,900. July 19th. (August 29th, 1911.)

Electrical Recording Instruments. W. R. Cooper. 17,888. July 26th.

Electric Hand Apparatus for Producing Light. W. E. Lake. (Fabrique Internationale d'Appareils a Magneto S.A.) 17,752. July 31st.

Interlocking Electric Starting Switchgear. A. H. Railing and C. C. Garrard. 21,120. September 17th.

Electric Motor-regulating Resistances. A. H. Railing and C. C. Garrard. 21,501. September 21st.

Electric Controlling Devices for Automatic Photographic Devices. S. Grossi. 21,588. September 21st.

Starting Devices for Electric Motors and like Apparatus. G. Ellison. 22,429. October 2nd.

Automatic Electric Current Controllers. L. Abbatecola. 23,542. October 15th. (March 26th, 1912.)

Electric Illuminated Revolving Advertising Apparatus. J. W. Horton. 23,977. October 21st.

Material for the Mirrors of Projectors. Siemens-Schuckertwerke Ges. 25,233. November 4th. (November 3rd, 1911.)

Electric Meters and Meter Systems and Relays adapted to Control the Same and for other Purposes. Siemens-Schuckertwerke Ges. 25,831. November 11th. (November 11th, 1911.)

Electrical Switches. B. D. Horton. 25,671. November 20th.

Electrical Apparatus for Indicating Speed and Direction of Revolution at a Distance. N. C. E. Flaman. 26,685. November 20th. (November 25th, 1911.)

Telephone Installations in which the Subscribers' Connections are Grouped according to the Number of Calls. Siemens & Halske Akt.-Ges. 28,751. December 18th. (December 19th, 1911.)

Devices for Discharging Electricity from Paper in Printing and like Machines. J. J. O'Toole. 29,785. December 24th.

Methods of Liberating Small Quantities of Gases or Vapours in Closed Glass Vessels under the Action of Light or Heat. Siemens & Halske Akt.-Ges. 29,891. December 28th. (December 30th, 1911.)

Electric Relays. British Thomson-Houston Co., Ltd. (General Electric Co.) 12,060. May 21st.

Lighting of Miners' and like Safety Lamps. A. Paxton. 14,547. November 25th. (November 26th, 1912.)

Telephone Exchange Systems. W. Aitken. 16,906. July 20th.

Electrical Apparatus for Timing and Recording the Finish of Races and the Like. R. Carlstedt. 17,666. July 30th. (May 14th, 1912.)

Method of Operating Electromagnetic Striking Tools by Means of Alternating Current. L. Schuler. 18,184. August 7th.

Brush Gear for Dynamo-electric Machinery. Lancashire Dynamo and Motor Co., Ltd., R. S. McLeod and J. H. Wild. 18,777. August 16th.

Electrical Arrangements for Protecting Ships' Bottoms and Submerged Structures from Barnacles or Aquatic Life and the Like. J. E. James. 19,297. August 23rd. (Addition to No. 14,181 of 1910.)

Apparatus for Producing Electric Oscillations Adapted for Wireless Communication and other Purposes. W. Dubilier. 19,763. August 29th. (Addition to No. 11,091 of 1912.)

Electric Traction Systems. J. E. Pollak. (Elektro-Motoren-Werke Hermann Gradenwitz.) 20,446. September 7th.

Protective Attachments for Telephone Mouthpieces and Earpieces. S. T. Richardson. 20,580. September 10th.

Telephone Apparatus. R. Lagus. 21,351. September 19th.

Dynamo-electric Machines. British Thomson-Houston Co., Ltd. (General Electric Co.) 21,761. September 24th.

Ventilation of Dynamo-electric Machines. British Thomson-Houston Co., Ltd., and H. W. Taylor. 21,866. September 25th.

Electric Telephones. L. G. Hammer. 24,408. October 25th.

Electric Furnaces and Process of Operating the Same. British Thomson-Houston Co., Ltd. (General Electric Co.) 26,082. November 13th.

Devices for Electrically Operating Tramway and Like Points. G. Davidson. 26,145. November 14th.

Automatic Reverse-current Cut-out Arrangement for Electric Circuits. P. Ackermann. 27,090. November 25th.

Electrically-heated Garments. A. C. Stubling. 28,846. December 14th.

1913.

Electric Terminal Connections for Aluminium and Similar Conductors. L. W. Chubb. 2,146. January 27th. (February 16th, 1912.)

Electromagnetic Switching Mechanism for Heavy-current Switches with Automatic Release. Bergmann Elektricitats Werke Akt.-Ges. 2,778. February 3rd. (February 1st, 1912.)

Electrical Signalling Apparatus for Lifts and the Like. G. A. Loudon. 4,256. February 19th.

Devices for Automatically Adjusting the Time of Ignition of Internal-combustion Engines. R. Bosch (Firm of). 4,692. February 24th. (March 14th, 1912.)

Electric Furnaces for Treating Metallic Filaments. G. Ludecke and Brimsdown Lamp Works, Ltd. 6,952. March 20th.

Telegraphic Transmitters. W. E. Shaw. 8,024. April 5th.

Cells which are Sensitive to Light and Provided with Aluminium Electrodes, and for which Acetone is Used as Electrolyte. C. Stille. 9,060. April 17th. (April 24th, 1912.)

Telephonic Reproducers. C. Stille. 9,644. April 24th. (April 24th, 1912.)

Loud-speaking Telephone Instruments. Kelvin & James White, Ltd., and M. B. Field. 9,782. April 25th.

Power Transmission and Control Apparatus on Motor Vehicles. J. G. P. Thomas and Thomas Transmission, Ltd. 12,841. July 23rd. (Divided application on No. 17,130 of 1912, July 23rd.)

Electromagnetic Weight-lifting Apparatus. Magnet-Werk Ges. Eisenach. 13,911. June 16th. (July 16th, 1912.)

Automatic Short-circuiting Device for Lightning Arresters. Siemens and Halske Akt.-Ges. June 19th. 14,214. (September 9th, 1912.)

Seasoning Timber Electrically.—In describing his latest researches in the electrical seasoning of timber, Dr. Nodon claims that his process can be applied in the forest where the trees are felled, since no cumbrous or costly equipment is required. The process depends on the electrolysis of cellulose and its derivatives. The newly-felled trees are sawn into thick planks and laid on a false flooring, one on top of the other, with the interposition, however, of moistened matting or similar material between each layer, to act as electrodes for the introduction of alternating current which is passed for 10 hours or so. The effect of the current is to produce chemical changes in the cellulose and the sap, rendering them impervious to decay. Further, the sap loses those gummy and hygroscopic characteristics which normally prevent rapid drying. It is claimed that timber thus treated is ready for use a few weeks after it is felled, and is harder, stronger, more homogeneous, easier to work and less warped by moisture than timber which has been seasoned by the ordinary air-drying process. Paving blocks treated by the Nodon process are said to have been in use at Bordeaux for six years without showing appreciable deterioration.